AQUATIC PLANTS of ILLINOIS

GLEN S. WINTERRINGER, ILLINOIS STATE MUSEUM • ALVIN C. LOPINOT, DEPARTMENT OF CONSERVATION

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AQUATIC PLANTS of ILLINOIS

An illustrated manual including species submersed, floating and some of shallow water and muddy shores.

GLEN S. WINTERRINGER
Illinois State Museum

ALVIN C. LOPINOT
Department of Conservation

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INTRODUCTION

This publication, AQUATIC PLANTS OF ILLINOIS: AN ILLUSTRATED MANUAL INCLUDING SPECIES SUBMERSED, FLOATING AND SOME OF SHALLOW WATER AND MUDDY SHORES, is the result of work done during and after the release of SUBMERGED AND FLOATING AQUATIC PLANTS OF ILLINOIS, A PRELIMINARY ILLUSTRATED MANUAL in May 1965. The latter publication, a trial copy designed for field use only, was distributed in limited numbers to fishery biologists, specialists in aquatic plant study and others most likely to offer constructive remarks after their examination and use of the manual. Nearly all of those to whom the preliminary manual was sent returned their marked copies or sent letters with suggestions for improvement. We found this correspondence most useful in preparing the present manual.

An explanation of the words "submerged" and "submersed" may help to clarify their use in the titles above. The word "submerged" implies that something is placed under water and in our usage this meaning does not apply. Botanically the word "submersed" means growing under water; it is used in this manual when we refer to plants growing entirely beneath the water surface. Use of the word "emersed" is intended to indicate standing in water or with some plant parts above water level.

The collection and identification of submersed, floating and emersed aquatic plants was undertaken jointly by the Illinois State Museum and the Illinois Department of Conservation in 1964-65. Conservation biologists of the Division of Fisheries collected many plants from hundreds of lakes, ponds and rivers throughout the State. In October, 1965, the closing date of the field project, 1188 collections had been made. Single collections often included six to eight, or more, different plant species. A uniform data sheet was included with each collection to insure accurate locality records for all specimens. The plants, kept moist in plastic bags, were mailed in heavy envelopes to the Illinois State Museum for study and processing. Notes on data sheets with each collection were made in pencil to prevent smudges. These data sheets were dried, numbered and filed for reference. On the reverse side of each sheet we verified the identifications or identified all plants in each collection. This information was regularly reported to the conservation biologists. After study and identification, the specimens were prepared for mounting and were eventually attached to standard herbarium sheets as permanent records, each bearing the usual data label. Approximately 2000 additional aquatic plant specimens have been added to the museum herbarium as a result of this project.

The following categories of aquatic plants were considered: (1) Submersed; (2) Floating; (3) With both submersed and floating leaves or parts; (4) Marsh and marginal (emersed); (5) Algae and liverworts; (6) Trees and shrubs. Only *Nostoc* and *Anabaena* of algal genera and *Riccia* and *Ricciocarpus* among liverworts have been included. Trees and shrubs were omitted entirely. Most species described and illustrated in the following pages will be found in the first four categories.

Originally our plan for this manual was to include only plants entirely floating, submersed or with both floating and submersed parts. It became apparent that biologists associated with the project were interested in the identification of many marginal plants not strictly within the floating or submersed classifications; thus some emersed plants were included. After listing

all species collected and identified during the field work, it was obvious that some plants were collected very frequently and others much less frequently. Our reason for including or excluding species was based on the number of times they were sent in for identification and tabulation. For some genera with many or several species occurring in Illinois, i.e.: *Cyperus, Scirpus, Sparganium, Alisma, Sagittaria*, etc., the illustration and description of one species is included in this manual to assist in identification of related species. None of the aquatic grasses will be found and other expected plants may be missing. A completely illustrated manual for identification of all plants either entirely or partially aquatic was far beyond the plan for this publication.

References to illustrations and descriptions in other manuals should be consulted. We have listed and given page references to four additional books or manuals; three of these contain good illustrations and the other is made up of keys and descriptions of Illinois plants. In preparing the general key for plant identification an attempt was made to use characters easily interpreted: leaf shape, arrangement, venation, margin, flowers, fruits and seeds. Two diagrams are included to assist in the identification of plant parts. Many aquatic plants are seldom available in flower or fruit; therefore details of flowering and fruiting parts are not consistently helpful. Use of vegetative parts entirely is also questionable since these, in some species, are similar and confusing. Thus care must be taken to include observation of as many parts of the plant, both vegetative and reproductive, as possible.

The semi-diagrammatic drawings bear numbers each of which should be matched with a corresponding number in the column to the right. This numbered column of notes will describe parts of the plant. Phrases or sentences without numbers are merely explanatory. Common names appear at the top of the column of notes. These names are based on the REPORT OF THE TERMINOLOGY COMMITTEE, WEED SOCIETY OF AMERICA and GRAY'S MANUAL OF BOTANY, Eighth Edition. The scientific name appears below the common name. Months when the plant is ordinarily in flower, fruit or seed, and its distribution, including a map, appear at the bottom of the page. A selected list of defined technical terms will be found in the glossary. The arrangement of plant families in this manual follows that of Jones in the FLORA OF ILLINOIS, Third Edition, 1963.

A few aquatic plants very infrequently collected are included, for by this means we hope to add to our knowledge of these species. Fishery biologists often need to identify plants to assist in the "housekeeping" of some ponds, lakes, streams and rivers. It is hoped that the information included will be helpful to them and to students and all interested persons who will find aquatic environments a challenging area of exploration.

ACKNOWLEDGMENTS

We are grateful to the following without whose help this work could not have been successfully completed: Dr. Edward G. Voss, University of Michigan, for permission to modify portions of his aquatic plant key and for assistance with the general plant key in this manual; Dr. Robert Henry, Western Illinois University; Dr. Robert A. Evers, Illinois Natural History Survey; Mr. Edward A. Munyer, Illinois State Museum; Mr. Floyd Swink, The Morton Arboretum, and

especially Mr. Ben Dolbeare for work on identification, preparation and mounting many aquatic plant specimens. The list becomes too long to include all of those we wish to thank for returning manuals and making helpful suggestions. Our special gratitude to Mrs. Nancy Coon for her assistance with drawings and manuscript; Miss Ruth Ann Skeen for typing and Mr. James Donovan for work on drawings in the preliminary manual.

Gratitude is also expressed to Miss Loretta Permentier who started tabulating and recording the plants identified and especially to Mrs. Edith Campbell who completed the work.

The following persons contributed specimens for this survey and manual: James Allen, Joe Bystry, Ben Dolbeare, Ray Fisher, A. W. Fritz, Tom Groutage, Robert Hiltibran, Rod Horner, James LaBuy, Roy Lockhart, Alvin C. Lopinot, T. Miller, Bruce Muench, A. C. Newton, Ed Pickering, O. M. Price, Leo Rock, Dick Rogers, Ken Russell, Rudy Stinauer, James Sublett, Gregg Tichacek, Paul Vidal, and George Zebrun.

GLEN S. WINTERRINGER, Illinois State Museum
ALVIN C. LOPINOT, Illinois Department of Conservation

SPECIAL REFERENCES

The following books will be very helpful in a study of aquatic plants and should be used in connection with this aquatic manual. We have given references to illustrations and descriptions in each, and to keys in the FLORA OF ILLINOIS.

1. Gleason, Henry A. 1952. THE NEW BRITTON AND BROWN ILLUSTRATED FLORA OF THE NORTHEASTERN UNITED STATES AND ADJACENT CANADA. Three volumes. Published by the New York Botanical Garden.

2. Fassett, Norman C. 1960. A MANUAL OF AQUATIC PLANTS. With a revision appendix by Eugene C. Ogden. Published by the University of Wisconsin Press, Madison.

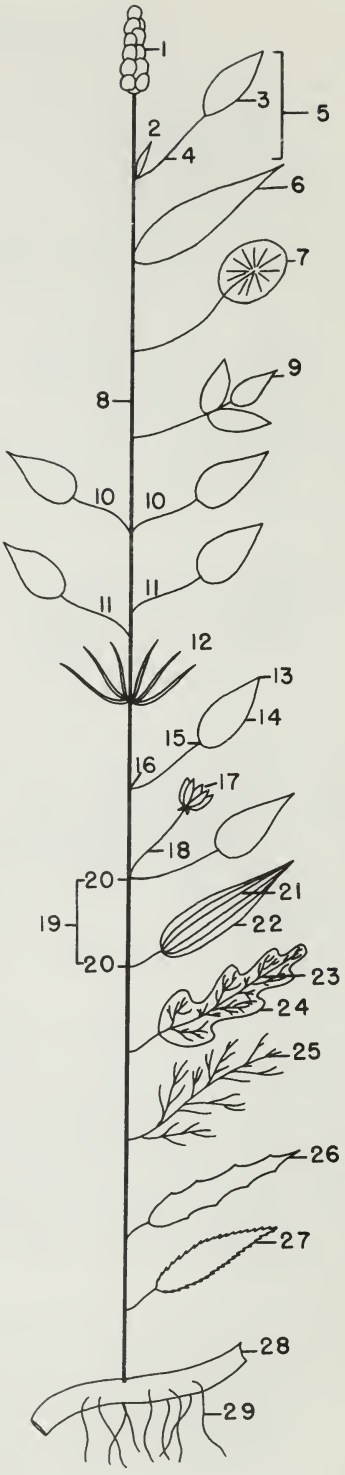
3. Muenscher, Walter C. 1944. AQUATIC PLANTS OF THE UNITED STATES. Published by the Comstock Publishing Company, Ithaca, New York.

4. Jones, George Neville. 1963. FLORA OF ILLINOIS. Third edition. Published by the University of Notre Dame Press, Notre Dame, Indiana. Contains keys for identification of Illinois plants (not illustrated).

We have used the following abbreviations in reference to the books above: (1) Gleason, (2) Fassett, (3) Muenscher, (4) Jones.

IDENTIFICATION OF PLANT PARTS

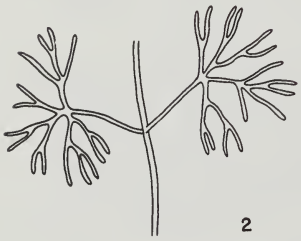
1. Spike
2. Stipule
3. Blade
4. Petiole
5. Simple leaf
6. Sessile leaf (no petiole)
7. Peltate leaf (petiole attached at mid-underside)
8. Stem
9. Compound leaf (with three leaflets)
10. Opposite leaves
11. Alternate leaves
12. Whorled leaves
13. Leaf apex (tip)
14. Leaf margin
15. Leaf base
16. Leaf axil
17. Flower in leaf axil
18. Peduncle
19. Internode (between two nodes or joints)
20. Node (joint)
21. Parallel veins
22. Margin entire
23. Net veins
24. Margin lobed
25. Finely dissected leaf
26. Margin dentate
27. Margin serrate
28. Rhizome (underground stem)
29. Roots



ARRANGEMENT OF DISSECTED LEAVES

1. Leaves whorled, palmately dissected.

   Example: *Ceratophyllum demersum.*

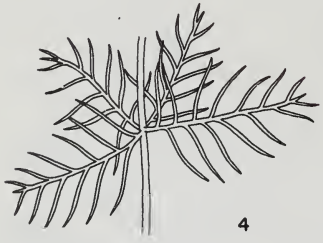


2. Leaves petioled and opposite.

   Example: *Cabomba caroliniana.*

3. Leaves petioled and alternate.

   Example: *Ranunculus trichophyllus.*



4. Leaves whorled, pinnately dissected.

   Example: *Myriophyllum exalbescens.*

USE OF IDENTIFICATION KEYS

Identification keys in this manual are made up of couplets each containing two contrasting, descriptive statements, i.e.: 1 - 1, 2 - 2, etc. In each case, start with the general vegetative key. If the plant being identified does not fit the description under the first number 1, proceed to the second number 1 further on in the key. All plants will be included under either the first or second number 1.

After a choice is made, proceed to the first part of the couplet immediately following the number 1 you selected. Continue to select that part of a couplet which most nearly describes the plant being identified until eventually your selection will include a page reference to a family or genus in the illustrated part of the manual. This family or genus may in turn be accompanied by additional keys and page references.

A GENERAL VEGETATIVE KEY TO FAMILIES AND GENERA

1. Plants entirely submersed or floating or having both submersed and floating parts. In some species flowering and fruiting parts may emerge above the water surface. Keep in mind that changes in water level may have a marked effect on growth and appearance of aquatic plants.

    2. Plants enclosed in a gelatinous or mucilaginous, nearly spherical mass, from 1 mm to 1 cm in diameter, blue-green in color. Non-flowering plants. Algae. Nostocaceae. *Nostoc* and *Anabaena*. Not illustrated.

    2. Plants not enclosed but if gelatinous or mucilaginous then not spherical.

        3. Plants with no distinct stems and leaves. Generally free floating. Segments or parts small, up to 20 mm in dimension, often much smaller. Sometimes remaining attached where budded from parent plant.

            4. Plants once to several times 2-lobed or 2-forked (dichotomous). Non-flowering plants. Floating liverworts. Ricciaceae. *Riccia* and *Ricciocarpus*. Page 26.

            4. Plants neither 2-lobed nor 2-forked.

                5. Plants with neither roots nor rootlets. About as broad as thick, globular, less than 2 mm in greatest dimension. Bright green or yellow-green. Lemnaceae. *Wolffia*. Page 111. If plants are thin, flat and curved, and 5 - 9 mm in greatest dimension. Lemnaceae. *Wolffiella*. Page 111.

                5. Plants with roots or rootlets. Segments flattened and usually more than 2 mm in greatest dimension.

                    6. Plants with several roots per segment. Segments rounded or obovate, 2.5 - 8 mm broad and with 5 - 7 nerves or lines on the upper side. Often purple-red on the underside where roots originate from a single point or node. Lemnaceae. *Spirodela*. Page 111.

                    6. Plants with one root per segment. Segments 4 mm or less broad, or not rounded in general outline. 1-5 faint nerves or lines on upper side. Lemnaceae. *Lemna*. Page 111.

        3. Plants with distinct stems and/or leaves.

            7. Entire plant free floating, very small and requiring magnification for study. About 10 - 15 mm wide with many very small, overlapping leaves crowded along an axis or stem. Moss-like plants often reddish or becoming so in late summer. Salviniaceae. *Azolla*. Page 30.

7. Entire plant usually rooted or at least attached to soil or substrate. Plants much larger, requiring no magnification for general observation.

8. Plants with floating leaves. The entire leaf or at least the terminal portion floating.

9. Blades of floating leaves sagittate (arrowhead-shaped), or with lobes at the base, or leaf peltate or compound.

10. Floating leaves compound, generally with 4 leaflets to each leaf (clover-like). Marsileaceae. *Marsilea*. Page 29.

10. Floating leaves simple, therefore with no separate parts to one leaf.

11. Floating leaves, at least some, sagittate, with leaf tip and lower lobes coming to a point. Alismaceae. *Sagittaria*. Page 66.

11. Floating leaves circular or elliptical, with a cleft or V-shaped sinus at the base, or leaves peltate.

12. Floating leaves with a V-shaped cleft or sinus, the petiole attached between the basal lobes of the leaf blade.

13. Leaves 3 - 4 cm wide, spongy beneath, in tufts from nodes (joints) of stem-like stolons rooting in mud or sometimes floating free. Hydrocharitaceae. *Limnobium*. Page 104.

13. Leaves much larger, 10 - 30 cm wide, not spongy beneath. Growing from thick root-like rhizomes well anchored. Plants seldom floating free.

14. Blades of floating leaves nearly circular but the lobes pointed. Veins radiating from the base of the midrib, not along the midrib. No basal submersed leaves persisting. Nymphaeaceae. *Nymphaea*. Page 36.

14. Blades of floating leaves broadly elliptical, from 1 1/2 to 2 times as long as wide, the lobes rounded. More pairs of veins radiating from along the midrib than from its base. Basal submersed leaves thin, present in early and mid-summer. Nymphaeaceae. *Nuphar*. Page 36 .

12. Floating leaves with no V-shaped cleft or sinus. The leaf blades peltate with the petiole attached at mid-underside.

15. Submersed leaves divided into very many narrow, thread-like divisions, palmate or fan-like from a short petiole. Cabombaceae. *Cabomba*. Page 34 .

15. Submersed leaves not present, leaves floating or emersed.

16. Leaves floating only, 5 - 10 cm long, elliptical. Petioles, stems and leaf blades underneath covered with a slimy, gelatinous coat. Flowers purplish, on stems not stiff. Cabombaceae. *Brasenia*. Page 34 .

16. Leaves both floating and emersed, often more than 15 cm broad, nearly circular, with no slimy, gelatinous coat. Flowers yellow on stiff stems well above water. Nelumbonaceae. *Nelumbo*. Page 39 .

9. Blades of floating leaves not sagittate, sometimes slightly cordate (heart-shaped) at the base, neither lobed, peltate nor compound.

17. Floating leaves small, less than 1 cm long, crowded into a rosette. Submersed leaves narrow, notched at the tips, distinctly opposite. Callitrichaceae. *Callitriche*. Page 56 .

17. Floating leaves more than 1 cm long, not in a rosette. Submersed leaves alternate, or basal or absent.

18. Leaves narrow, ribbon-like, alternate or apparently basal. Leaf blades much longer than wide, with no distinct petiole. Sparganiaceae. *Sparganium*. Page 120.

18. Leaves, at least floating ones, not narrow and long, but elliptical and with distinct petioles.

19. Leaves all basal, lower parts of the petioles overlapping. Alismaceae. *Alisma*. Page 66.

19. Leaves not basal but alternate.

20. Leaf veins netted, stems with a papery sheath around nodes (joints). Flowers pink in a dense, ovoid or cylindrical spike. Polygonaceae. *Polygonum*. Page 44.

20. Leaf veins parallel, stems with no papery sheath. Flowers dull green in a narrow, cylindrical spike. Potamogetonaceae. *Potamogeton*. Page 76.

8. Plants with no floating leaves, entirely submersed or with some flowering or fruiting parts above the water surface.

21. Plants with leaves or leaf-like structures all simple, basal or in basal tufts.

22. Leaves definitely flat, several times as wide as thick, widest at the middle or with nearly parallel sides.

23. Leaves stiff, erect, less than 20 cm long and resembling knife-blades. Alismaceae *Sagittaria*. Page 66.

23. Leaves limp, more than 20 cm long and tape-like or ribbon-like.

24. Midvein not evident, all veins of about the same prominence. Smaller cross veins give a checkered appearance. Flowers greenish in globular heads. Fruiting heads spiny. Sparganiaceae. *Sparganium*. Page 120.

24. Midvein and additional longitudinal veins evident but not all of equal prominence.

25. Leaves with zones of venation, the central third or more of different texture, being more densely reticulate (netlike) than outer marginal zones. Pistillate (seed producing) flowers on a long, spiral peduncle. Hydrocharitaceae. *Vallisneria*. Page 104.

25. Leaves with no zones of central or marginal venation. Veins more uniform in appearance. Alismaceae. *Sagittaria*. Page 66.

22. Leaves not flat but thread-like or wider and tapering from base to tip, sometimes slightly flattened near the base.

26. Leaves thread-like, not broader basally, not sheathing basally, generally in tufts with fruiting parts in terminal heads or spikelets, and these seldom on submersed plants. Cyperaceae. *Eleocharis*. Page 121.

26. Leaves wider, tapered from base to tip, expanded at the base to enclose dark pouch-like sporangia. Non-flowering plants. Isoetaceae. *Isoetes*. Page 27.

21. Plants with leaves or leaf-like structures not basal but attached along a stem. Leaves simple or dissected or at least with some forked segments.

27. Leaves compound, dissected, forked or deeply lobed, opposite, or whorled or alternate.

28. Leaves mostly or all opposite or whorled.

29. Leaves with evident petioles 5 - 15 mm long if well developed. Blades finely dissected, fan-shaped. Cabombaceae. *Cabomba*. Page 34.

29. Leaves with no evident petioles. The blades pectinate (comb-like) or dissected with segments forking once or twice.

30. Leaves forking dichotomously once or twice, leaf segments with a few teeth along one side or margin. Ceratophyllaceae. *Ceratophyllum*. Page 40.

30. Leaves not forking dichotomously, leaf segments with no teeth.

31. Leaves pectinate with a straight central axis following the midrib. Flowers and fruits in our species in terminal spikes often above water. Haloragaceae. *Myriophyllum*. Page 50.

31. Leaves not pectinate and with no central axis following the midrib. Submersed leaves much dissected, those emersed merely serrate. Flowers yellow. Compositae. *Bidens*. Page 65.

28. Leaves alternate.

32. Leaves with a definite central axis following the midrib.

33. Leaves pectinate but lateral segments not again branched. Flowers and fruits sessile in leaf axils. Haloragaceae. *Proserpinaca*. Page 50.

33. Leaves not pectinate but with lateral segments again branched or narrowly divided. Flowers white on an emergent stalk, each flower with a short pedicel. Cruciferae. *Armoracia*. Page 42.

32. Leaves with no definite central axis following the midrib.

34. Petiole present, sometimes short and bearing a stipular sheath. Plants with no bladders present on leaves or branches. Flowers white or yellow, regular. Ranunculaceae. *Ranunculus*. Page 31.

34. Petiole absent. Stipular sheath absent. Leaves thread-like, often buried in mucky debris and often bearing bladder-like organs. Flowers yellow or purple, irregular. Lentibulariaceae. *Utricularia*. Page 63.

27. Leaves simple, usually entire or with a few teeth in some species. Opposite, whorled, or alternate.

35. Leaves alternate with ligule-like (stipular) structures.

36. Leaf blades thread-like, round, at least half as thick as broad, the stipule attached to the leaf base 10 - 30 mm or more, forming a sheath around the stem.

37. Stipule wholly attached to the round leaf blade. Fruits arranged umbel-like on a long, often coiled peduncle. Potamogetonaceae. *Ruppia*. Page 76.

37. Stipule only partly attached, with a short, free extension at the tip. Leaf blade somewhat flattened. Fruits sessile in a spike with a straight peduncle. Potamogetonaceae. *Potamogeton*. Page 76.

36. Leaf blades flattened, several times broader than thick even if narrow, or with the stipule little if at all attached to the blade or with both these conditions.

38. Blades flattened, ribbon-like, 5 - 7.5 mm wide, with no definite midrib or central vein more prominent than others. Flowers solitary, yellow. Submersed plants seldom flowering. Pontederiaceae. *Heteranthera*. Page 101.

38. Blades thread-like or flattened with a definite midrib. Flowers greenish in a globose or cylindrical spike. Potamogetonaceae. *Potamogeton*. Page 76.

35. Leaves opposite or whorled with no ligule-like or stipular structures.

39. Leaves opposite. In some species with tufts of leaves in axils which may give a falsely whorled appearance.

40. Leaves thread-like, smooth, not more than 0.5 mm wide, very gradually tapering from base to tip, opposite or sometimes in whorls of 4 at each node. Fruits curved, 2 - 3 mm long with small teeth on the convex side. Potamogetonaceae. *Zannichellia*. Page 76.

40. Leaves not thread-like.

41. Leaves large, 5 - 13 cm long, 5 - 20 mm wide, sessile, clasping, the margin obscurely toothed. Leaves often limp. Completely submersed plants seldom flower; if flowers are present then in axillary racemes. Scrophulariaceae. *Veronica*. Page 60.

41. Leaves smaller, shorter or narrower or both.

42. Mature leaves with distinct petioles, the expanded blade diamond-shaped. Flowers very small and sessile in leaf axils. Onagraceae. *Ludwigia*. Page 48.

42. Mature leaves sessile.

43. Leaves expanded at the base into rounded or abrupt lobes. Teeth of leaf margins from conspicuous to very minute. (Use hand lens). Fruits longer than wide. Najadaceae. *Najas*. Page 70.

43. Leaves not expanded at the base but with nearly parallel sides. Leaf margins with no teeth. Fruits globular. Lythraceae. *Peplis*. Page 47.

39. Leaves definitely whorled.

44. Branches (not true leaves) round, longer than wide and often spine-like. Usually stiff with calcium deposits and with a musky odor. Reproductive structures (not seeds) yellow-orange. Characeae. *Chara*. Page 25. Plants, if similar, but soft in texture are probably Characeae. *Nitella*. Page 25.

44. Leaves flat, not stiff with calcium deposits and with no musky odor.

45. Leaves 6 - 12 in a whorl, not more than 2.5 mm wide, from 12 - 15 times as long as wide. Flowers and fruits small, in axils of leaves. Hippuridaceae. *Hippuris*. Page 58.

45. Leaves 3-4 in a whorl, rarely 6. 2.5 - 6 mm wide, 1 - 2 cm long. Stem round, smooth. Hydrocharitaceae. *Elodea*. Page 104.

1. Plants with most parts erect and above the water surface. Flowering and fruiting parts above the water. Plants of wet areas, muddy banks, shores, or growing in shallow water. Keep in mind that changes in water level may have a marked effect on growth and appearance of aquatic plants.

46. Plants with hollow, grooved stems, easily separated joints (not nodes). Very small, scale-like leaves fused in a stem sheath at each joint. Cone-like fruiting bodies at tips of some stems. Non-flowering plants. Equisetaceae. *Equisetum*. Page 28 .

46. Plants with no hollow, grooved stems. Leaves neither scale-like nor fused in a stem sheath. Joints or nodes not easily separated. With no cone-like fruiting bodies. Flowering plants or seed-bearing plants.

47. Plants with grass-like or sword-like leaves and stems (culms), many times longer than wide.

48. Plants with apparent stems or culms usually solid, round (cylindrical), or triangular, not hollow as in most grasses.

49. Flowering parts (inflorescence) terminal, in a head-like or branching umbel often large, and with several long, grass-like bracts at its base. Cyperaceae. *Cyperus*. Page 121 .

49. Flowering parts appearing lateral (from side of the stem), with no long, grass-like bracts, or with a single bract appearing as if a continuation of the stem, or flowering parts terminal with 2 or more bracts. Cyperaceae. *Scirpus*. Page 121 .

48. Plants with no apparent stems, leaves attached basally.

50. Leaves (sterile culms) round their entire length, neither expanded at the base nor sheathing each other. Flowers in a single, terminal spikelet. Cyperaceae. *Eleocharis*. Page 121 .

50. Leaves flattened and sheathing at the bases.

51. Leaves tapering from a hard, corm-like base, expanded basally to enclose dark, pouch-like sporangia. Non-flowering plants. Isoetaceae. *Isoetes*. Page 27 .

51. Leaves narrow but about the same width, not expanded basally, arising from thick rhizomes.

52. Leaves with many fine, parallel veins but no prominent midvein. Very small flowers, numerous and crowded into a long, cylindrical spike 10 - 20 cm long, turning brown in late summer. Plants not fragrant when bruised or broken. Typhaceae. *Typha*. Page 118.

52. Leaves with a prominent midvein off-center of the leaf. Flowers spike-like from the side of the stalk (scape), not terminal. Plants fragrant when bruised or broken especially at the base. Araceae. *Acorus*. Page 108.

47. Plants with no grass-like leaves and stems (culms), the blades not many times longer than wide.

53. Leaves entirely basal and with long stalks (petioles). (Pickerel weed has one leaf on the flowering stalk).

54. Leaves arrowhead-shaped, the acute lower lobes extending down. Main veins arising from the base between the lobes.

55. None of the veins more prominent than others. Each lobe bearing 3-4 veins. Flowers white with 3 petals, in a raceme. Alismaceae. *Sagittaria*. Page 66.

55. Midvein and those descending into the lobes more prominent than numerous other fine veins in the lobes. Flowers small, clustered in a club-shaped spadix surrounded with a green tapering spathe (envelope). Araceae. *Peltandra*. Page 108.

54. Leaves broadly oval (elliptical), or round and peltate or heart-shaped.

56. Leaves broadly oval (not rounded), 2 - 20 cm long with a conspicuous midrib and 6-8 additional veins from the base. Blade narrowed to its base and petiole. Flowers very small, petals 1 - 2.5 mm long, but very numerous and often in a large panicle. Alismaceae. *Alisma*. Page 66.

56. Leaves round and peltate or heart-shaped, the lower lobes, if present, not acute.

57. Leaves round, peltate, 60 - 70 cm wide, veins radiating from the center. Upper surface depressed to the center. Petiole attached at mid-underside. Flowers yellow, 15 - 30 cm wide when fully open, on long, stiff peduncles. Nelumbonaceae. *Nelumbo*. Page 39.

57. Leaves heart-shaped with a V-shaped sinus or cleft, or with no V-shaped sinus or cleft.

58. Leaves with a V-shaped sinus or cleft.

59. Leaf blade 3 - 10 cm long, the sinus shallow, petioles long, slender, flowers solitary, cream color, about 2 cm wide. Hydrocharitaceae. *Limnobium.* Page 104.

59. Leaf blade 20 - 40 cm long, the sinus deep, petioles stout, flowers solitary, about 3.5 - 5 cm wide, bright yellow. Nymphaeaceae. *Nuphar.* Page 36.

58. Leaves with no V-shaped sinus or cleft.

60. Leaves with a conspicuous midrib and 6 additional veins, the blade sometimes 20 cm long. Flowers small, white, in whorls of 3-6. Flower stalk (peduncle) with no leaves. Alismaceae. *Echinodorus.* Page 66.

60. Leaves with no conspicuous midrib, all veins very fine and numerous. Blade often 18 cm long. Flowers small, blue, in a tight, spike-like panicle. Flower stalk bearing a single leaf. Pontederiaceae. *Pontederia.* Page 101.

53. Leaves neither entirely basal nor with long stalks (petioles), but on an elongate stem.

61. Leaves all simple, neither lobed, divided, pinnate nor pectinate.

62. Leaves opposite.

63. Leaves with no petioles (sessile), margins serrate or entire.

64. Leaves longer than wide, the bases clasping, margins slightly serrate. Flowers in axillary racemes sometimes 15 cm long. Scrophulariaceae. *Veronica.* Page 60.

64. Leaves nearly round, the bases sessile but not clasping. Flowers several on separate pedicels 1 - 1.5 cm long in upper leaf axils. Scrophulariaceae. *Bacopa.* Page 60.

63. Leaves with petioles, margins entire.

65. Leaves with slender petioles, the blades 5 - 30 mm long, diamond-shaped. Flowers small, sessile in leaf axils. Onagraceae. *Ludwigia*. Page 48.

65. Leaves with no petioles but tapering to the base, the blades 8 - 16 cm long. Flowers on slender peduncles from upper leaf axils. Acanthaceae. *Dianthera*. Page 62.

62. Leaves alternate.

66. Stems with swollen joints and a papery sheath at each joint. Leaves elliptical to lanceolate 7 - 15 cm long with rounded tips. Flowers bright pink in cylindrical or ovoid spikes. Two forms of the plant are known: Leaves of the aquatic form are smooth, those of the terrestrial form are more or less hairy. Polygonaceae. *Polygonum*. Page 44.

66. Stems with no swollen joints and no papery sheath, flowers not pink.

67. Leaves 4 - 5 cm long, margins entire, narrowed at the base to slender petioles. Each flower yellow, showy, on a slender peduncle 1 - 5 cm long from a leaf axil. Onagraceae. *Jussiaea*. Page 48.

67. Leaves 5 - 10 cm long, margins serrate, the blade tapering at each end. Flowers greenish in a flattened, terminal cyme. Crassulaceae. *Penthorum*. Page 46.

61. Leaves lobed or finely divided or pinnate (feather-like) or pectinate (comb-like).

68. Plants with two forms of leaves: emersed leaves serrate, submersed leaves finely divided or pinnate or pectinate.

69. Submersed leaves deeply pectinately divided (comb-like). Emersed leaves serrate. Flowers very small in axils of emersed leaves. Haloragaceae. *Proserpinaca*. Page 50.

69. Submersed leaves deeply pinnately divided (feather-like). Emersed leaves serrate. Flowers white on upper emersed branches often bare of leaves when flowering. Cruciferae. *Armoracia*. Page 42.

68. Plants with all leaves essentially alike in appearance but all pinnately lobed or deeply pectinate.

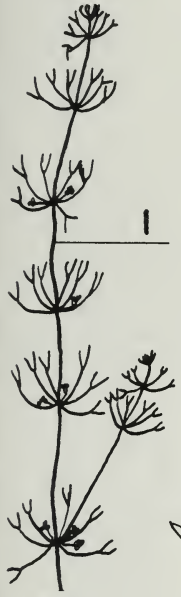
70. Leaves pinnately lobed with 1-12 round or oval leaflets. Stems crisp, not inflated. Widely distributed in Illinois, in clear, cool water. Cruciferae. *Rorippa*. Page 42 .

70. Leaves deeply pectinate. Stems spongy, inflated. Flowers in whorls from upper stems. Known only from southern Illinois. Primulaceae. *Hottonia*. Page 59 .

The species of *Chara* and *Nitella* are non-flowering plants. The reproductive structures, at nodes of the stems, are generally brightly colored red to orange. Magnification is required for careful study. Plants, when crushed, often have a musky odor.

REFERENCE

Prescott, G. W. 1951. Algae of the Western Great Lakes Area. Cranbrook Institute of Science Bull. No. 30. p. 329.



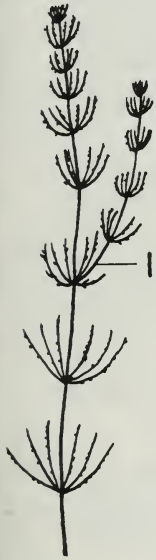
NITELLA
Nitella sp.

1. Submersed stem generally branching at each node and with additional whorled branches having forked tips. Plants mostly limp and flexible, bright green in color and seldom encrusted with lime.

2. Whorled branches at a node. Drawing enlarged 2 times.

Summer months. In waters of varying hardness.

Distribution: Probably state wide.



CHARA
Chara sp.

1. Submersed stem with whorls of stiff, short branches bearing leaflets, gray-green in color and generally encrusted with lime from hard water. The amount of encrustation depends perhaps on the water in which the plants grow. Several species are known in Illinois.

2. Whorled branches at a node. Drawing enlarged 2 times.

Summer months. In waters of varying hardness.

Distribution: Probably state wide.

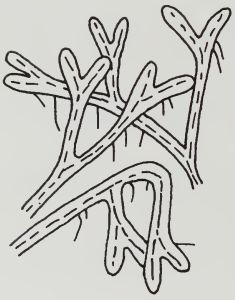
The thallus, or plant body, of these leafy liverworts is composed of segments bearing small root-like rhizoids on the underside. Liverworts are non-flowering plants. A few are aquatic, but many others grow in wet places.

REFERENCES

Fassett: 40-42.
Smith, G. M. 1938. Cryptogamic botany. Vol. 2, Bryophytes and Pteridophytes New York, McGraw-Hill Book Company, pp. 9-75.

SLENDER RICCIA

Riccia fluitans L.



The thallus flat and stem-like, segments forking near the ends, floating just under the water surface often in tangled masses. Small root-like rhizoids are on the underside of the segments. Drawing enlarged 3 times.

May - September. Ponds and slowly moving water.

Distribution: Probably state wide.

PURPLE-FRINGED RICCIA

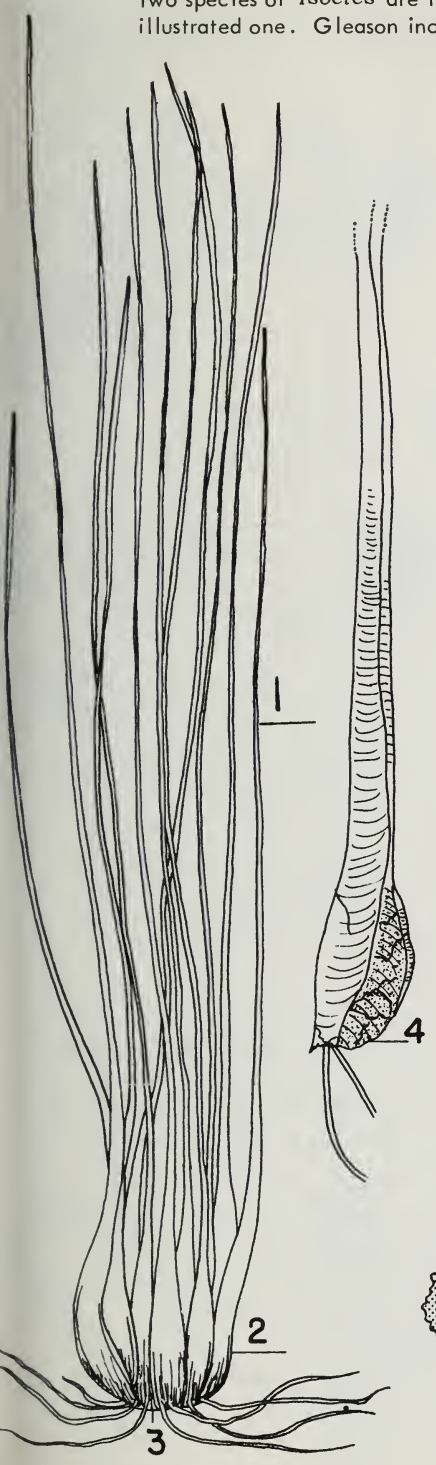
Ricciocarpus natans (L.) Corda

The thallus flat, stem-like, segments furrowed above and with 2 rounded lobes, floating on the water surface. Small root-like rhizoids are on the underside of the segments. Drawing enlarged 1 1/2 times.

May - September. Ponds and slowly moving water.

Distribution: Probably state wide.

Two species of *Isoetes* are listed in the FLORA OF ILLINOIS and we have illustrated one. Gleason includes ten species of eastern United States.



REFERENCES

Gleason: Vol. 1, 9-12.
Fassett: 44-47.
Muenscher: 339-345.
Jones: 40.

BLACKFOOTED QUILLWORT

Isoetes melanopoda Gay & Dur.

1. Leaves 10-30 cm long, 1-1.5 mm wide, numerous, grass-like, hollow.

2. Leaves arising from a fleshy, flattened stem (corm). Leaf bases flattened, clasping, swollen and enclosing dark-colored sporangia. This is not a seed plant.

3. Roots from the basal, flattened base.

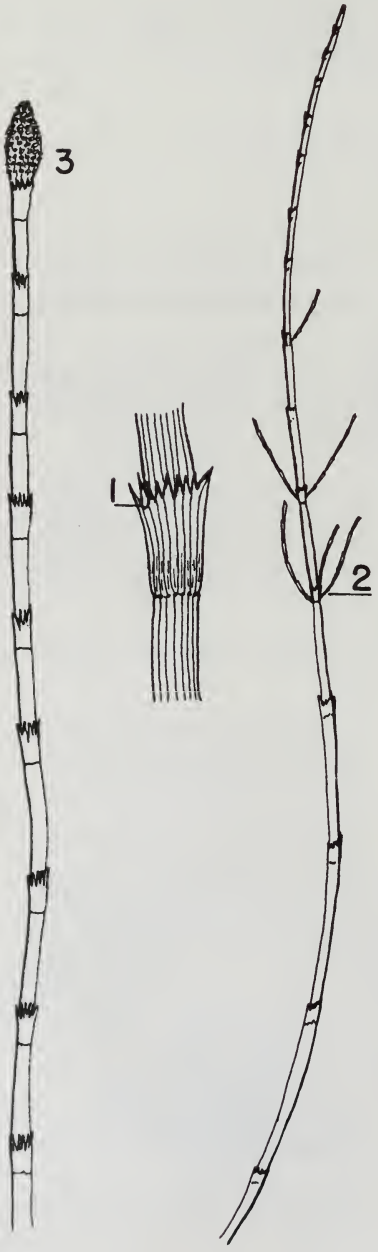
4. Portion of a leaf and leaf base showing the basal sporangium. Drawing enlarged 4 times.

Isoetes produces microspores or megaspores in the dark-colored sporangia. Magnification is required for examination of the spores.

July - September. Wet fields and shallow, often temporary, ponds.

Distribution: Scattered localities, probably state wide.

There are seven species of *Equisetum* listed in the FLORA OF ILLINOIS and we have illustrated one. All of the horsetails are plants of moist soil, ditches or shallow water.



REFERENCES

Gleason: Vol. 1, 12-17.
Fassett: 42-45.
Muenscher: 345-347.
Jones: 41.

WATER HORSETAIL

Equisetum fluviatile L.

1. Leaves very small, the tips black, in a whorl around a joint and fused as a sheath around the stem at each joint. Drawing enlarged 2 times.

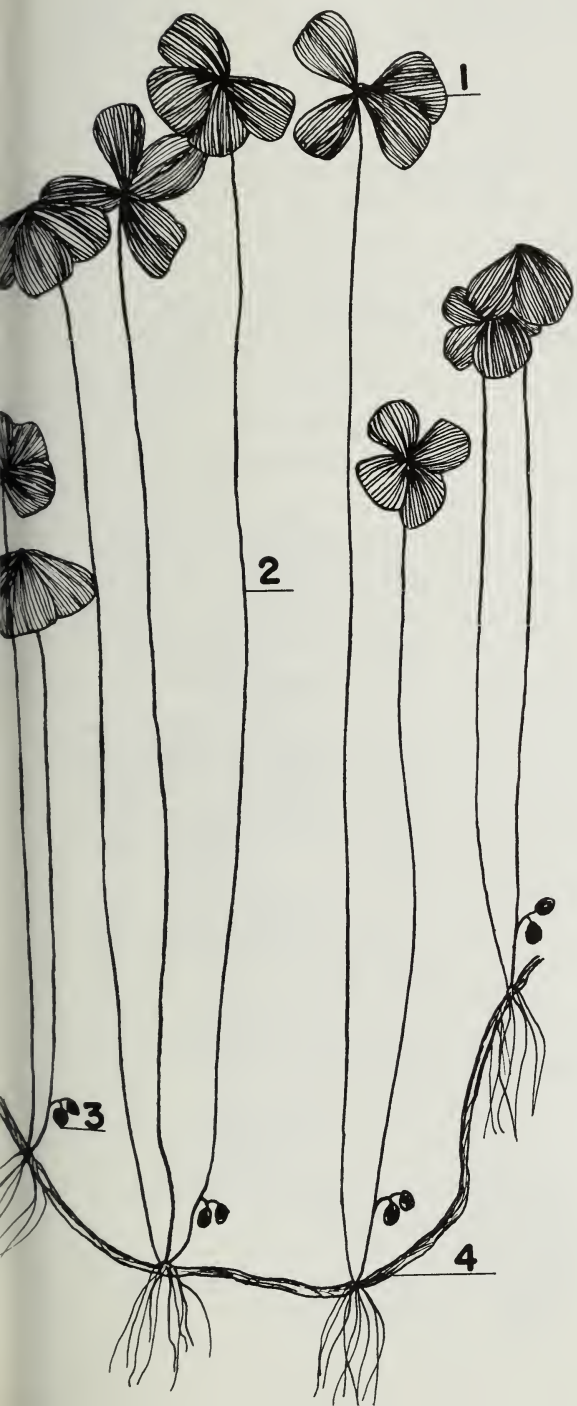
2. Stems up to 1m long, 3-7.5mm wide, emersed, ridged, the joints conspicuous. A few branches sometimes present. The reddish rhizomes are buried in soil.

3. Stem bearing a cone which produces sporangia and spores. The horsetails are not flowering plants.

May - December. Shallow water.

Distribution: Northern half of the state.

One species of *Marsilea*, originally introduced into the United States from Europe, is known in Illinois.



REFERENCES

Gleason: Vol. 1, 22 and 24.
Fassett: 42-43.
Muenscher: 346-349.
Jones: 48.

PEPPERWORT

Marsilea quadrifolia L.

1. Leaves floating, submersed or emergent. The blade divided into 4 parts (clover-like). Each leaflet 8.5 - 25 mm long and narrowed to the base. Veins fine, numerous and often forking. Leaflets fold at night and on cloudy days.

2. Petioles 35 - 40 cm long or longer, slender, in alternate rows from the rhizome.

3. Fruiting bodies are dark brown sporocarps 4 - 5 mm long, oval, each with a short pedicel. The stalk attached near the base of the leaf petiole. Pepperwort is not a seed plant.

4. Rhizome slender, creeping in mud and bearing roots.

June - December. Shallow to deep water of ponds and lakes. Introduced from Europe.

Distribution: Probably state wide.

The two mosquito ferns found in Illinois are very small floating plants with 2-lobed leaves. Rhizomes, to which the leaves are attached, have Y-shaped (dichotomous) branching above every third leaf. Plants appear gray-green in summer but become reddish as the growing season advances. Individual plants float in masses and may cover the water surface over large to small areas. Use a hand lens for field study.

Key to Species of *Azolla*

Single plant 10 - 15 mm wide. *Azolla mexicana*. Page 30 .
Single plant 5 - 10 mm wide. *Azolla caroliniana*. Not illustrated.

REFERENCES

Gleason: Vol. 1, 21-22. Muenscher: 347 and 350.
Fassett: 42-43. Jones: 48.

MOSQUITO FERN

Azolla mexicana Presl

1. Leaves very small, 2-lobed, upper lobes .07 - .09 mm long, the lower lobes about the same size, gray-green, velvety, turning purple-brown in late summer. Drawing enlarged 8 times.

2. Rhizomes, to which leaves are attached, with Y-shaped or forked branches. Plants floating in moss-like masses made up of very many separate plants. Drawing enlarged 8 times.

3. Roots few or sometimes none, very slender, from the undersides of the leaves.

4. A mass made up of many plants. About natural size.

July - September. Floating on quiet water.

Distribution: Western and southern parts of the state.

There are twenty-three species of *Ranunculus* listed in the FLORA OF ILLINOIS. Three of these are considered aquatic and other species are likely to be found in wet areas but are hardly submersed aquatic plants.

Key to Species of *Ranunculus*

1. All leaves submersed, finely divided into very narrow segments, flowers white or cream on slender peduncles.

   2. Leaves nearly sessile, rigid when taken out of water. *Ranunculus longirostris*. Page 31 .

   2. Leaves with petioles, soft and collapsing out of water. *Ranunculus trichophyllus*. Page 32 .

1. Leaves with some of the upper often three-parted and emersed, the lower submersed and palmately dissected with segments 1 - 2 mm wide, flowers yellow on long, stout peduncles. *Ranunculus flabellaris*. Page 33 .

REFERENCES

Gleason: Vol. 2, 170-174.
Fassett: 218-225.
Muenscher: 246-251.
Jones: 53.

RIGID WHITE WATER BUTTERCUP

Ranunculus longirostris Godr.

1. Submersed leaves 1-2 cm long, not collapsing when out of water, finely dissected into very narrow segments, sessile, or petioles short with clasping sheaths at the base.

Emersed leaves none.

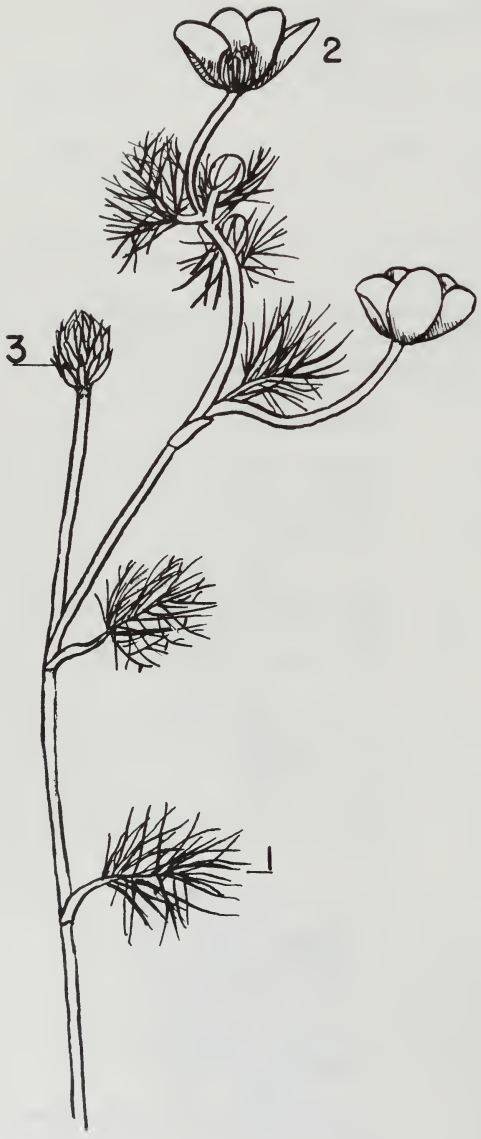
2. Stem submersed, branched, rooting at the nodes.

3. Flowers 1 - 2 cm wide, white, emersed on short peduncles.

Fruits (achenes) in globular clusters, each individual achene with a short beak.

May - July. Ponds and slowly moving water.

Distribution: Probably state wide.



COLLAPSING WHITE WATER BUTTERCUP

Ranunculus trichophyllus Chaix

1. Submersed leaves 1.5 - 4 cm long, 3-5 cm wide, finely dissected into very narrow segments and collapsing when out of water, distinct petioles 5-20 mm long with sheaths clasping at the base.

Emersed leaves none.

2. Flowers 0.5-1.8 cm wide, white, on emersed peduncles.

3. Fruits (achenes) in globular clusters, each achene with a very short beak.

May - July. Ponds and slowly moving water.

Distribution: Mostly the northern half of the state.

YELLOW WATER BUTTERCUP

Ranunculus flabellaris Raf.

1. Submersed leaves 2-10 cm long, 2-12 cm wide, usually alternate, dissected into narrow segments, petioles 5-8 mm long.

2. Emersed leaves, if present, 3-parted with the lobes cleft but not finely dissected.

3. Stem often hollow, rooting at the nodes.

4. Flowers yellow, petals twice the length of the sepals, emersed peduncles often thick and sturdy.

5. Fruits (achenes) in globular clusters, each achene with a short beak.

April - June. Ponds, slowly moving water.

Distribution: Mostly northern half of the state.

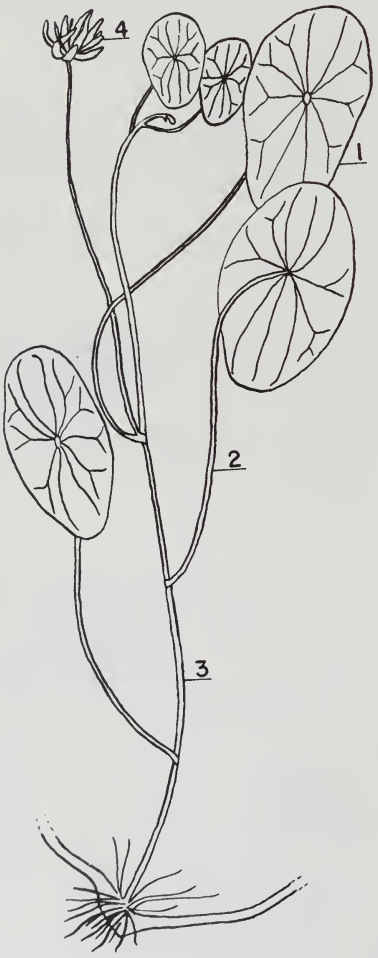
Key to Genera

All leaves floating, entire, peltate and with a slimy, gelatinous coating. *Brasenia*. Page 34 .

Some entire floating leaves, most leaves submersed, dissected into narrow segments and neither peltate nor with a slimy, gelatinous coating. *Cabomba*. Page 35 .

REFERENCES

Gleason: Vol. 2, 147-148.
Fassett: 209 and 216-217.
Muenscher: 233-234.
Jones: 58.



WATER SHIELD
Brasenia schreberi Gmel.

1. Floating leaves 3.5-12 cm long, alternate, about half as wide, oval.
Submersed leaves none.

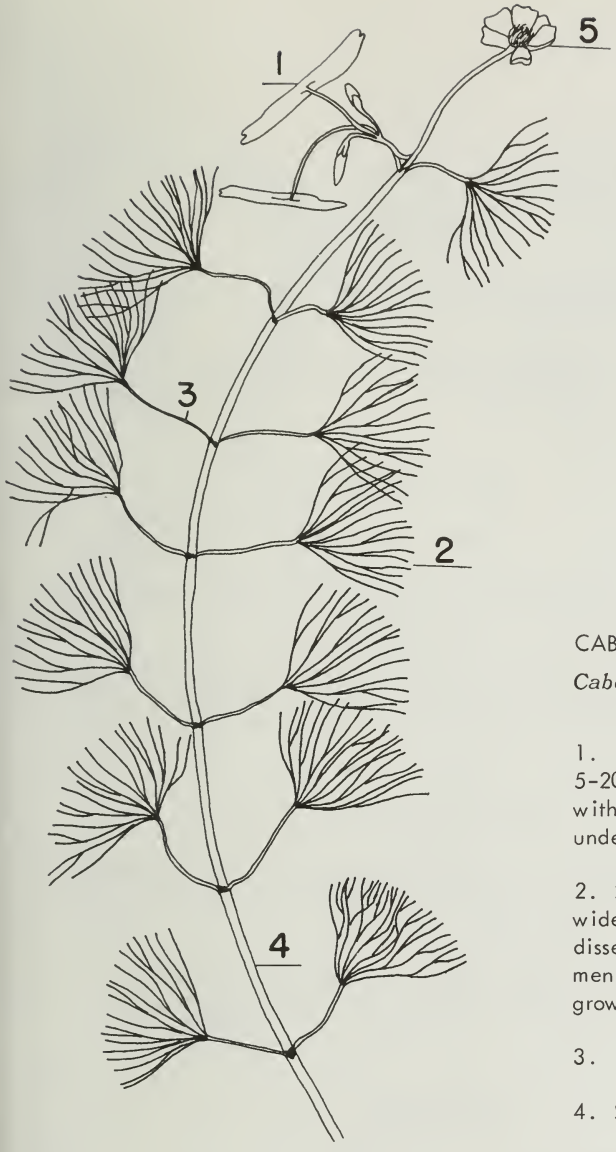
2. Petiole long, slender, attached at mid-underside of the leaf blade. Underside of leaves slimy, gelatinous.

3. Stems slender, long, with a slimy, gelatinous covering. Rhizome buried in the mud.

4. Flowers floating, dull purple, petals 10 - 15 mm long.

June - July. Ponds and slowly moving water.

Distribution: Scattered but probably state wide.



CABOMBA

Cabomba caroliniana Gray

1. Floating leaves, when present, 5-20 mm long, narrow or oval, with the petiole attached at mid-underside.

2. Submersed leaves 2.5-5 cm wide, opposite, fan-shaped and dissected into many narrow segments, often crowded at tips of growing branches.

3. Petioles 1 - 3.5 cm long.

4. Stem up to 2 m long, slender.

5. Flowers 5.5 - 8 mm long, white to pale yellow, the sepals and petals similar, on pubescent peduncles from upper leaf axils.

May - September. Ponds.

Distribution: Southern part of the state.

NYMPHAEACEAE (WATER LILY FAMILY)

Key to Genera

Flowers bright yellow and ball-like even when open, leaf blades oval, petioles stout. *Nuphar*. Key below.

Flowers white, not ball-like when fully open, leaf blades round, petioles slender. *Nymphaea*. Key below.

Keys to Species

Nuphar (Pond Lily)

Leaf petioles round, inner surface of the sepals usually yellow, petals numerous and smaller. *Nuphar advena*. Page 37.

Leaf petioles flattened, especially near the blade. inner surface of the sepals with red bases, petals numerous and smaller. *Nuphar variegatum*. Not illustrated.

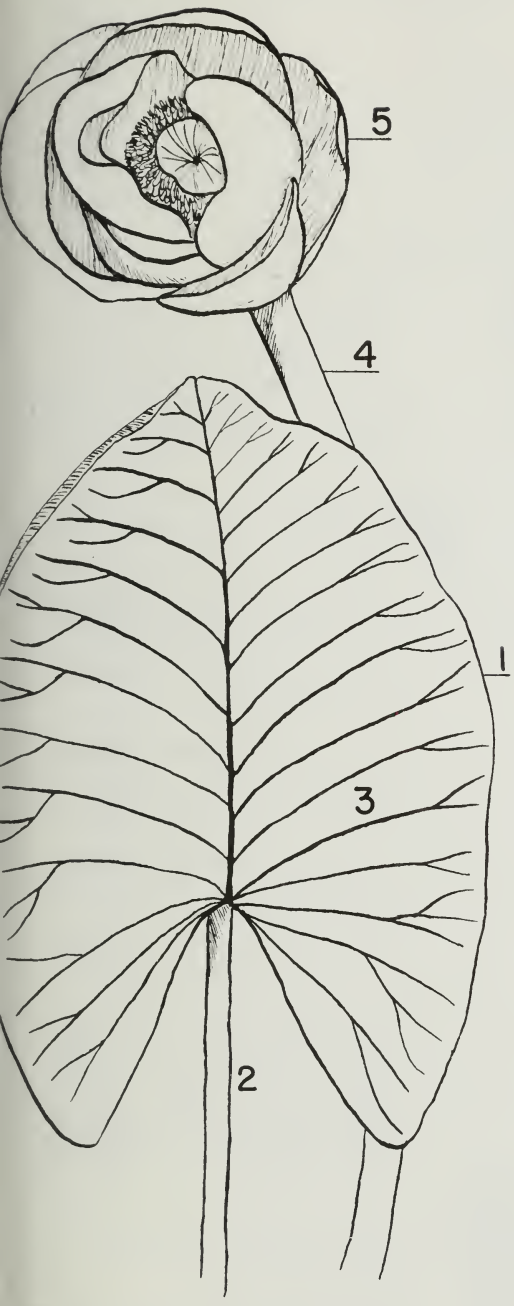
Nymphaea (Water Lily)

Flowers 15 - 25 cm wide when open, with little or no fragrance, petals spatula shaped. Leaves usually green on both sides. Rhizomes thick, bearing tubers. *Nymphaea tuberosa*. Page 38.

Flowers 6 - 12 cm wide when open, noticeably fragrant, petals elliptical. Leaves usually purple-red beneath. Rhizomes with no tubers. *Nymphaea odorata*. Not illustrated.

REFERENCES

Gleason: Vol. 2, 146-151.
Fassett: 210-215.
Muenscher: 237-246.
Jones: 58.



SPATTERDOCK

Nuphar advena Ait.

1. Emersed leaves 25 - 45 cm long, oval to elliptical, 1 1/2 times longer than wide.

2. Rounded basal lobes of leaves separated by a V-shaped sinus with a stout petiole attached between the lobes.

Floating leaves seldom developed.

Submersed leaves present in early summer and often larger and thin compared with emersed leaves.

3. Veins arising along the midrib in 15-20 pairs, branching as they approach the leaf margin.

4. Peduncles of flowers stout.

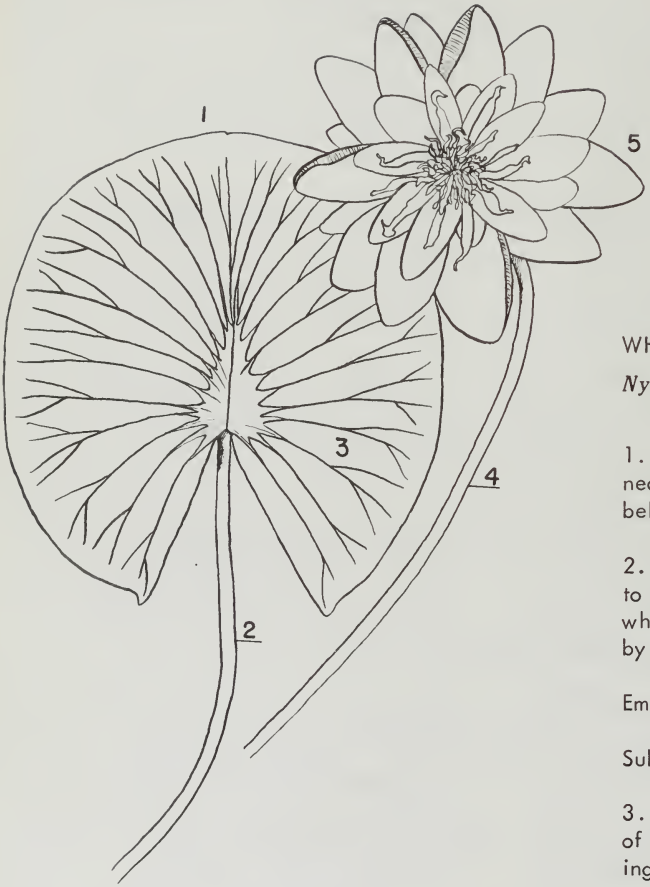
5. Flowers emersed, solitary, yellow, 5 - 10 cm wide when fully open, outer sepals green, central disk greenish 1.5 - 2.5 cm across with 12-18 rays on its surface.

Fruit oval to round, about 4 cm in length.

Roots from a buried, thickened rhizome.

June - August. Ponds and slowly moving water.

Distribution: Probably state wide.



WHITE WATER LILY

Nymphaea tuberosa Paine

1. Floating leaves 20-40 cm wide, nearly circular, green above and below.

2. The petiole slender, attached to the blade between the lobes which are pointed and separated by a V-shaped sinus.

Emersed leaves sometimes present.

Submersed leaves none.

3. Veins radiating from the base of the midrib in 12-15 pairs, dividing near the leaf margin.

4. Peduncles of flowers slender.

5. Flowers 15-25 cm wide, solitary, floating or barely emersed, with 4 sepals green on the back, numerous white petals and yellow anthers. Flowers with little or no fragrance.

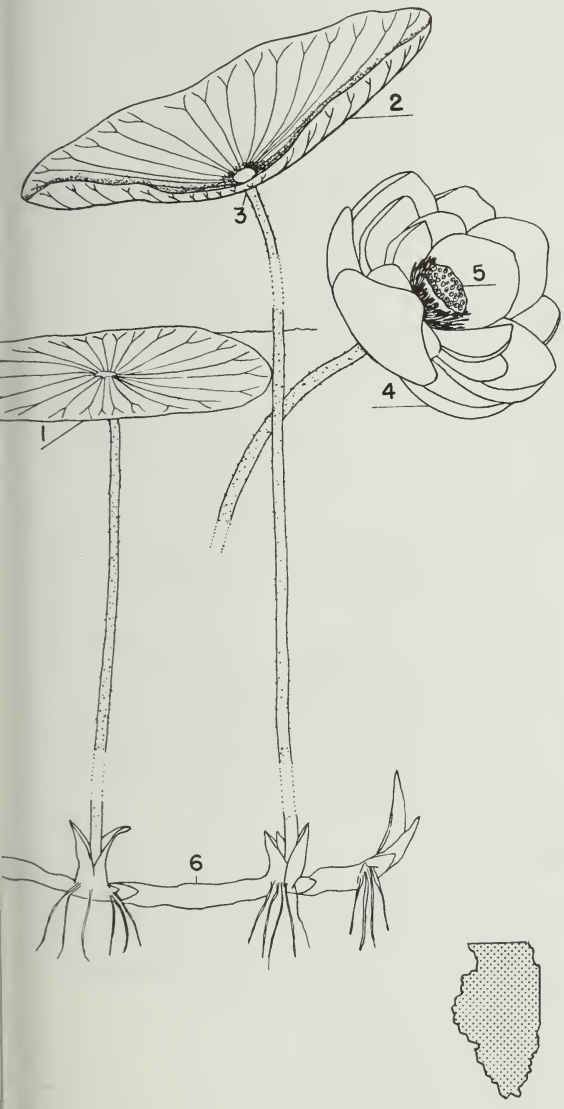
June - September. Ponds and slowly moving water.

Distribution: Probably state wide.

Nelumbo lutea, sometimes called water chinquapin, is abundant along the Mississippi and Illinois Rivers. It is sometimes introduced into ponds and lakes where it may form colonies acres in extent.

REFERENCES

Gleason: Vol. 2, 148.
Fassett: 216-217.
Muenscher: 234-236.
Jones: 59.



AMERICAN LOTUS

Nelumbo lutea (Willd.) Pers.

1. Floating leaves circular, of variable size, with petioles attached at mid-underside. Such leaves may be juvenile or appear early in the season.

Submersed leaves none.

2. Emersed leaves up to 60-70 cm broad, circular, entire, depressed to the center of the upper surface.

3. Petioles up to 1m long, attached to blade at mid-underside, rough, stiff.

4. Flowers 15-30 cm wide when fully open, solitary, pale yellow, on stiff peduncles up to 1 m long, sepals and petals up to 25 or more, the outer sepals green, stamens yellow and numerous.

5. Receptacle 5 - 10 cm across, in the center of the flower, with fruits embedded in its surface, yellow as flower opens, turning green and later dark brown.

Individual fruits about 1 cm wide, oval, dark brown, hard and nut-like.

6. Underground rhizome. Plants spread extensively by this means.

July - August. Shallow water of lakes, ponds and rivers.

Distribution: Scattered throughout the state.

Key to Species of *Ceratophyllum*

Leaves rather stiff and rigid, palmate, the divisions (segments) with teeth along one side. Achenes, with three spines, borne in leaf axils. *Ceratophyllum demersum*. Page 40 .

Leaves softer in texture, not rigid and stiff, palmate, the divisions (segments) nearly thread-like and with few or no teeth along one side. Achenes, with 10 - 12 spines, borne in leaf axils. *Ceratophyllum echinatum*. Page 41 .

REFERENCES

Gleason Vol. 2, 146-147.
Fassett: 210-211.
Muenscher: 228-231.
Jones: 59.

COONTAIL

Ceratophyllum demersum L.

1. Submersed leaves 1 - 3.5 cm long, in whorls of 2-10 or more, stiff, palmately divided from the base. Leaf segments 0.5 mm wide, flat, serrate or spined along one side.

2. Portion of a leaf. Drawing enlarged 4 times.

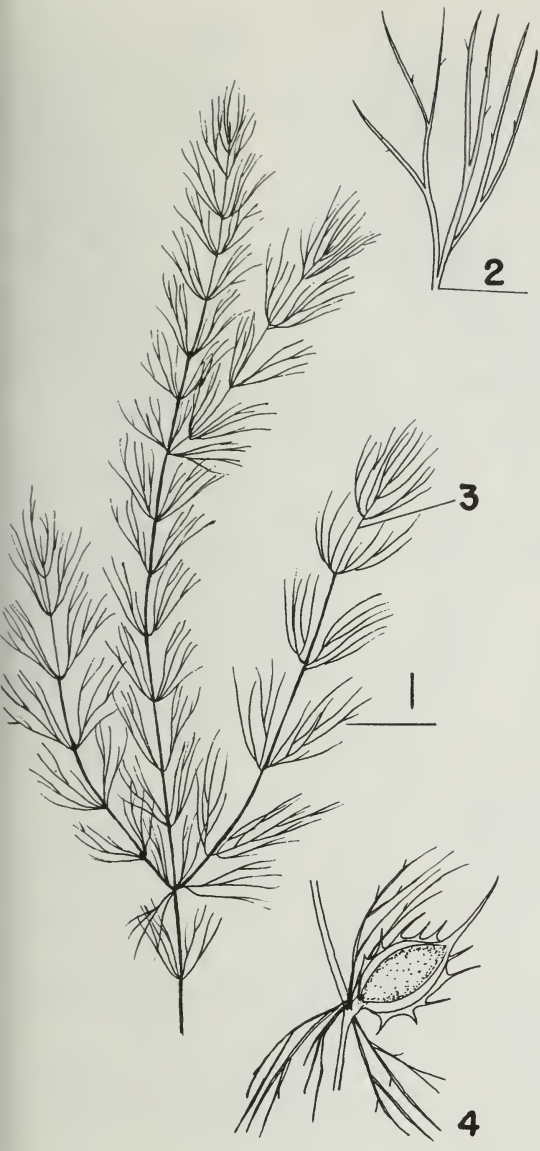
3. Stem with leaves often crowded at the tips giving the "coontail" effect. Entire stem may be 20-50 cm long.

Flowers very small, concealed in leaf bases, pistillate and staminate on the same plant (monoecious).

4. Fruits 4-7 mm long, concealed in leaf bases. The dark brown achene has 2 basal spines and 1 terminal spine. Achenes difficult to see in fresh material but often observed as material dries. Drawing enlarged 5 times.

July - September. Ponds and slowly moving water.

Distribution: Probably state wide.



PRICKLY COONTAIL

Ceratophyllum echinatum Gray

1. Submersed leaves 1 - 3 cm long, in whorls of 2 - several, less stiff than those of *C. demersum*, palmately divided from the leaf base. Leaf segments 0.5 mm wide, with very few or no teeth along one side.

2. Portion of a leaf. Drawing enlarged 2 times.

3. Stem similar to that of *C. demersum* but more delicate.

4. Fruit similar in size to that of *C. demersum* but with winged margins and 3-5 spines. Difficult to see in fresh material but sometimes observed as material dries. Drawing enlarged 2 times.

July - September. Ponds and slowly moving water.

Distribution: Scattered localities and probably state wide.

There are thirty-two genera representing this family in Illinois. Some species in various genera may be plants of wet ground, but we have considered only one species in each of two genera, *Rorippa* and *Armoracia*, as aquatic.

Key to Genera in this manual

Submersed and emersed leaves unlike. Submersed dissected into thread-like segments, emersed merely serrate. *Armoracia*. Page 42.

Submersed and emersed leaves essentially alike, all pinnately lobed with 1-12 round to oval leaflets. *Rorippa*. Page 43.

Note: In some manuals *Armoracia aquatica* (Eat.) Wieg. may be listed as *Neobeckia aquatica* (Eat.) Greene, and *Rorippa nasturtium-aquaticum* (L.) Hayek, may be listed as *Nasturtium officinale* R. Br.

REFERENCES

Gleason: Vol. 2, 226-227, 238-239.
Fassett: 234-237.
Muenscher: 253-254.
Jones: 75.

LAKE CRESS

Armoracia aquatica (Eat.) Wieg.

1. Submersed leaves alternate and dissected into many narrow segments. The plant often produces rosettes of leaves when growing in mud or shallow water.

2. Emersed leaves 3 - 7.5 cm long, alternate, lanceolate, margins serrate. Leaves soon fall from flowering plants.

Floating leaves none.

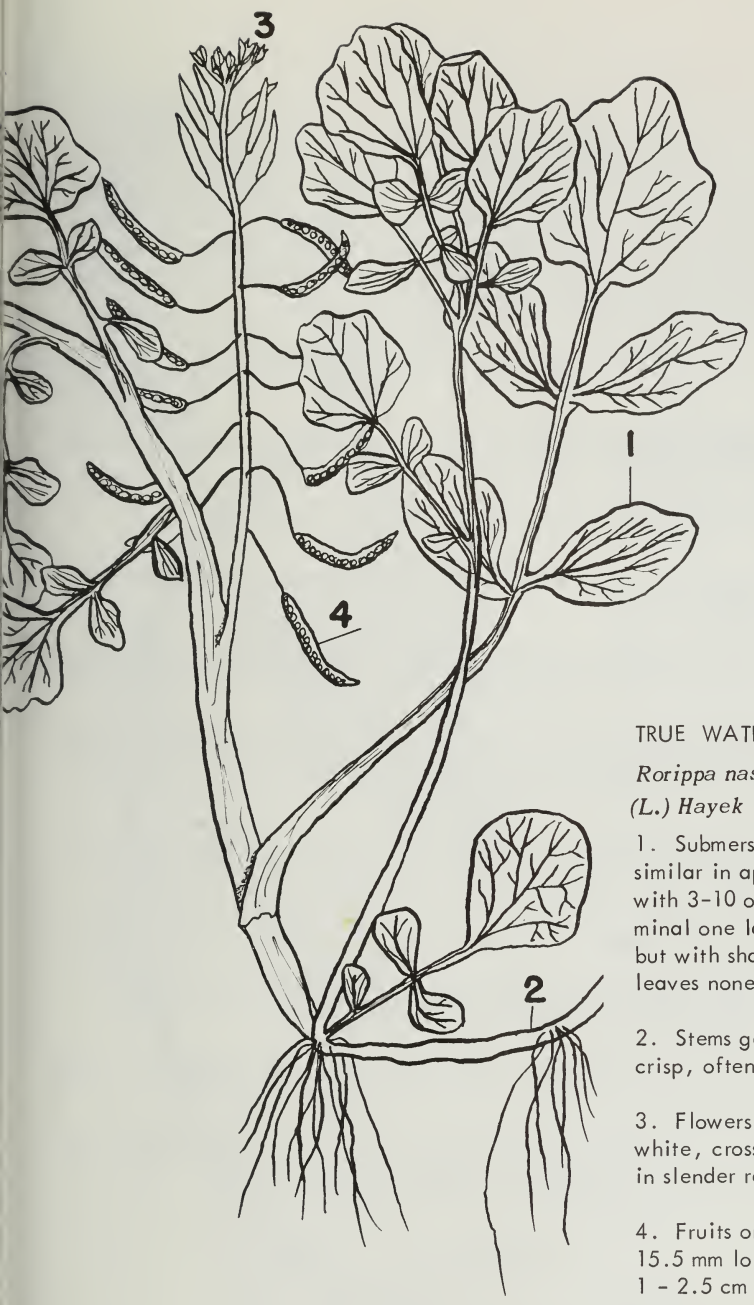
3. Submersed stems often enlarged and bearing roots and leaves.

4. Flowers 5-5.8mm long, small, white, with 4 sepals and petals, in racemes on emersed stems.

5. Fruits 5 - 5.8 mm long, oval, tipped with a persisting style 2 - 4.5 mm long. Each fruit on a pedicel 1 cm long.

June - August. Ponds and slowly moving water.

Distribution: Scattered areas throughout the state.



TRUE WATER CRESS

Rorippa nasturtium-aquaticum (L.) Hayek

1. Submersed and floating leaves similar in appearance, compound, with 3-10 oval segments, the terminal one larger, margins entire but with shallow lobes. Emersed leaves none.

2. Stems generally brittle and crisp, often rooted.

3. Flowers 4.5 - 5 mm wide, white, cross-shaped or cruciform, in slender racemes.

4. Fruits on slender pedicels 8 - 15.5 mm long, individual fruits 1 - 2.5 cm long, curved.

May - September. In clear, cold, especially spring, water.

Distribution: Probably state wide in suitable habitats.

POLYGONACEAE (KNOTWEED FAMILY)

There are twenty-three species of *Polygonum* listed in the FLORA OF ILLINOIS. Some of these are aquatic and others may be found on wet soil. Rainfall will alter the amount of water present and some species continue to flower and produce seeds regardless of abundance of water. Only the following five species and one form are considered in this key.

Key to Species of *Polygonum*

1. Flowers pink, small and crowded in a stout, terminal, usually solitary spike. Plants with submersed or floating leaves.

    2. Flowering spike seldom more than 3 cm long, ovoid.

        3. Aquatic form with leaves smooth, glossy above. *Polygonum fluitans.* Page 45 .

        3. Terrestrial form with leaves pubescent or somewhat hairy. *Polygonum fluitans* forma *hartwrightii.* Not illustrated.

    2. Flowering spike seldom less than 4 cm and up to 10 cm in length, cylindrical. Leaves lanceolate with sharp tips, hairy above and below. *Polygonum coccineum.* Not illustrated.

1. Flowers white or greenish-white in slender, terminal spikes and in axils of upper leaves. Plants of shallow water or wet soil.

    4. Calyx with glandular dots (punctate).

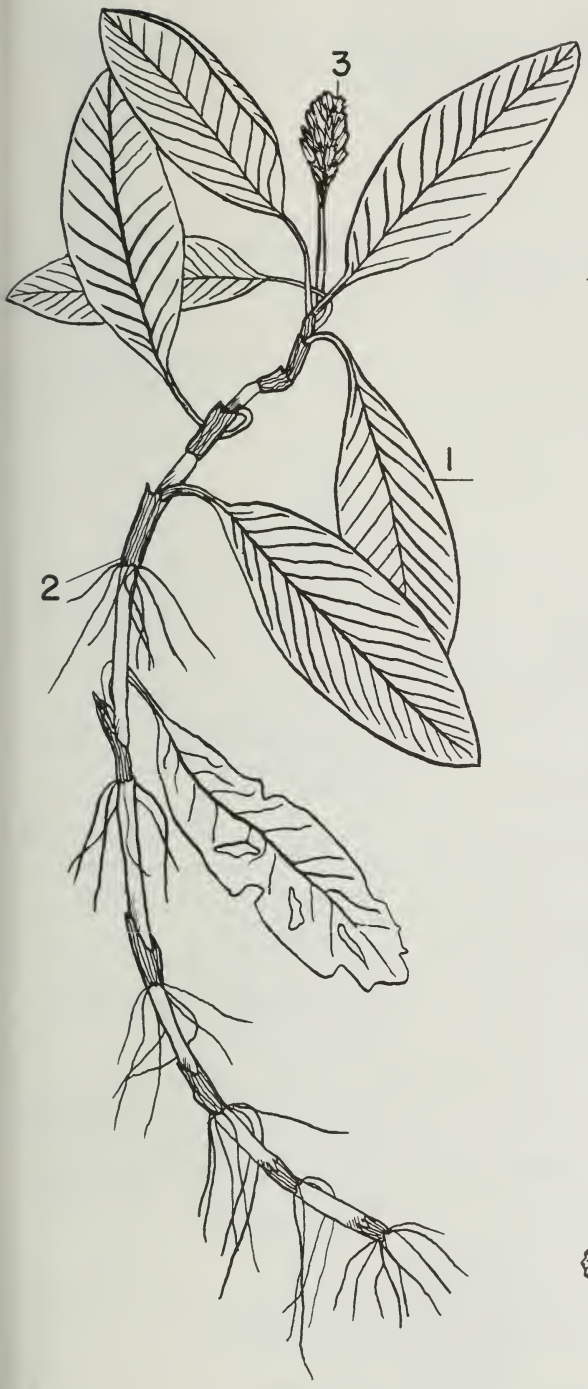
        5. Flowering spikes drooping, seeds (achenes) dull. *Polygonum hydropiper.* Not illustrated.

        5. Flowering spikes erect, seeds shiny. *Polygonum punctatum.* Not illustrated.

    4. Calyx with no glandular dots (not punctate). The flowering spikes erect. *Polygonum hydropiperoides.* Not illustrated.

REFERENCES

Gleason: Vol. 2, 74-84.
Fassett: 198-209.
Muenscher: 214-217.
Jones: 94-97.



WATER SMARTWEED

Polygonum fluitans Eaton

1. Floating leaves 4 - 9 cm long, alternate, broadly oval to elliptical, glossy, smooth, leaf tips generally blunt, petioles 1 - 5.5 cm long.

Emersed leaves, when present, become more lanceolate, slightly hairy, with leaf tips sharp or tapering.

2. Stems rooting at joints, stipules united to form a papery tube or sheath at the joints.

Rhizomes, from which stems grow, tough, buried in mud.

3. Flowers very small, numerous, pink, crowded into oval spikes 1 - 3 cm long. Seeds (achenes) 2.5 mm wide, broadly oval, dark brown to black.

June - August. Shallow water of ponds and lakes.

Distribution: Northern two-thirds of the state.

Penthorum, with thin leaves, does not resemble some fleshy-leaved members of the family such as: live-forever, hen and chickens, stonecrops and sedums, but the flowers, fruits and seeds of all of these are very similar.

REFERENCES

Gleason: Vol. 2, 254-255.
Fassett: 239-240.
Muenscher: Not listed.
Jones: 143.

DITCH STONECROP

Penthorum sedoides L.

1. Leaves generally emersed, 5-12 cm long, alternate, lanceolate, tapering at each end, margins sharply toothed.

2. Stem 20-65 cm long, often curved at the base and rooting, with leafy shoots present.

3. Flowers numerous, yellow-green, very small, along the upper sides of a flat-topped cyme 2-9 cm long. Fruit with 5 follicles united at their bases to form a 5-horned capsule.

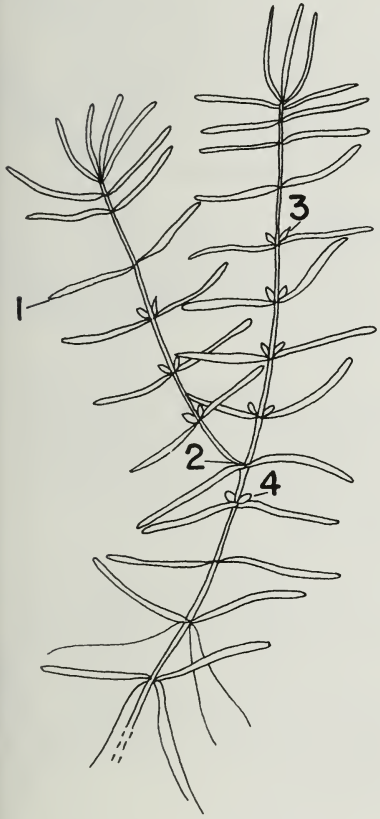
July - September. On wet ground and in shallow water.

Distribution: State wide.

In some manuals *Peplis diandra* may be listed under *Didiplis diandra* (Nutt.) Wood. Other genera of the family include plants of ditches, wet soil and shallow water. Among these are: *Rotala, Ammania, Decodon, Cuphea* and *Lythrum*, none of which are included in this manual.

REFERENCES

Gleason: Vol. 2, 575-578.
Fassett: 255-256.
Muenscher: 267-269.
Jones: 160-161.



WATER PURSLANE

Peplis diandra Nutt.

1. Submersed leaves 1 - 2.5 cm long, opposite, thin, narrow, the sides about parallel, tips rounded, sessile, with the base as wide as the blade.

Emersed leaves, when present, shorter than submersed leaves and tapering to the base.

2. Stems generally submersed, delicate and branching.

3. Flowers greenish, very small, in leaf axils.

4. Fruit a capsule, very small, in leaf axils.

June - August. On wet ground or in shallow water.

Distribution: State wide.

This family is represented by six genera in Illinois. Of these, *Ludwigia* with four species and *Jussiaea* with three, are aquatic or at least include plants of wet ground. We have illustrated and described one species in each of these genera.

Key to Genera in this manual

Leaves alternate, petals bright yellow, seed capsule on slender peduncle . *Jussiaea*. Page 48 .

Leaves opposite, petals small, greenish or lacking, seed capsule sessile. *Ludwigia*. Page 49 .

REFERENCES Gleason: Vol. 2, 581-586.
Fassett: 257-261.
Muenscher: 269-274.
Jones: 163-166.

CREEPING WATER PRIMROSE

Jussiaea repens L.

1. Floating and emersed leaves 3 - 8.5 cm long, alternate, lanceolate or longer than wide, smooth, narrowed at the base to slender petioles 2 - 4.5 cm long. Submersed leaves none.

2. Stems 1 m or more long, creeping on mud or floating, sometimes red-brown in color, rooting at nodes, curving up at the leafy ends.

3. Flowers showy, yellow, petals 9 - 14 mm long. Petals at the tip of a slender, cylindrical hypanthium 6 - 10.5 mm long which tapers to a pedicel 1 - 4.5 cm long, in leaf axils.

4. Fruit a cylindrical capsule 3-5 cm long. Sepals often persisting as the capsule grows and matures.

5. Leaves, in spring and early summer, may be oval and not longer than wide. Compare with No. 1.

May - September. Muddy banks and pond edges.

Distribution: Southern half of the state.

FALSE LOOSESTRIFE

Ludwigia palustris (L.) Ell.

1. Floating and emersed leaves 1 - 4 cm long including a slender petiole, opposite. Expanded blade of leaf diamond-shaped.

2. Submersed leaves up to 6 cm long, thin.

3. Stems slender, rooting at the nodes, floating or creeping on mud and often forming mats.

4. Flowers very small, with no petals, in leaf axils.

5. Fruit a 4-sided capsule 3 - 5 mm long.

6. Fruit. Drawing enlarged 3 times.

July - September. Muddy banks and pond edges.

Distribution: Probably state wide.

Key to Genera

Submersed leaves whorled, pectinate (comb-like), with a straight central axis following the midrib. Emersed leaves (bracts) present in terminal flowering and fruiting spikes. *Myriophyllum*. Key below.

All leaves alternate, submersed leaves deeply pectinate with narrow segments, emersed leaves serrate. Flowers and fruits in axils of emersed leaves. *Proserpinaca*. Page 55.

Accurate identification of species of *Myriophyllum* requires examination of the fruiting parts generally borne on emersed, spike-like tips of branches. These fruits are hard, nut-like and four-lobed. Each fruit eventually separates into four parts or mericarps either smooth or rough on the backs. A hand lens will be necessary for examination and study.

Key to Species of *Myriophyllum*

1. Backs of mericarps with two ridges (keels), roughened or with tubercles.

    2. Bracts (leaf-like) of fruiting spikes with serrate or finely toothed margins and longer than flowers and fruits. *Myriophyllum heterophyllum*. Page 51.

    2. Bracts of fruiting spikes with deeply pectinate (comb-like) margins and longer than flowers and fruits. *Myriophyllum pinnatum*. Page 52.

1. Backs of mericarps not ridged but round and generally quite smooth.

    3. Submersed leaves finely divided, alternate or scattered. *Myriophyllum humile*. Not illustrated.

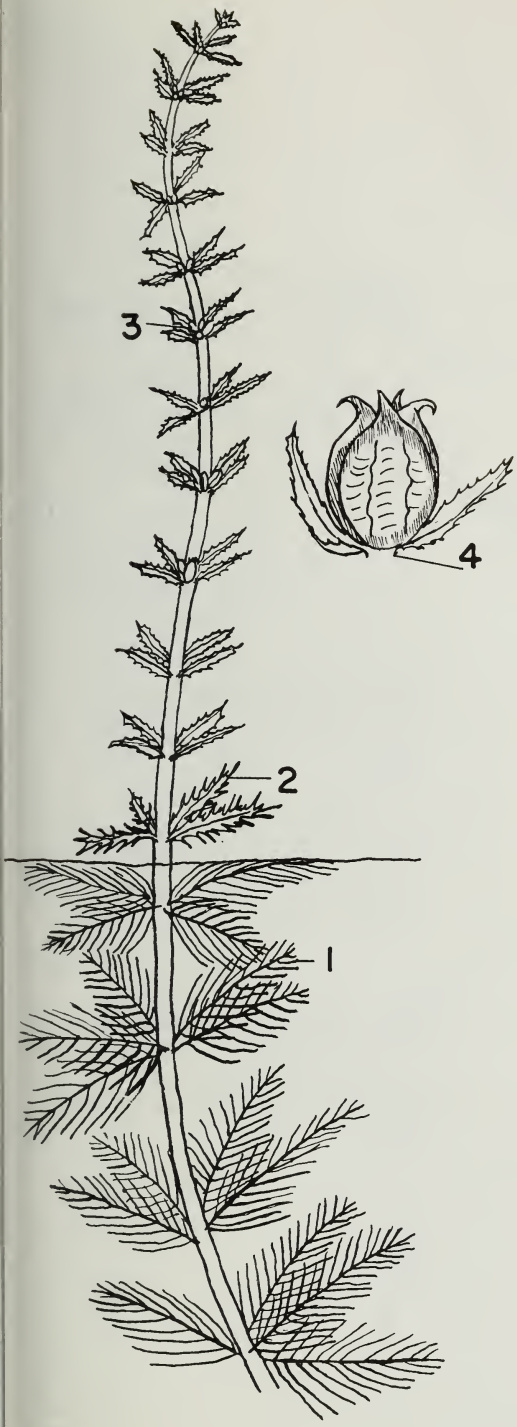
    3. Submersed leaves finely divided, in whorls (groups) of three, four or five.

        4. Bracts entire or nearly so, small, much shorter than or barely as long as flowers and fruits. *Myriophyllum exalbescens*. Page 53.

        4. Bracts deeply pectinate and about as long as flowers and fruits. *Myriophyllum verticillatum*. Page 54.

REFERENCES

Gleason: Vol. 2, 598-602.
Fassett: 261-268.
Muenscher: 278-286.
Jones: 166-167.



BROADLEAF WATER MILFOIL

Myriophyllum heterophyllum Michx.

1. Submersed leaves 2-5cm long, in whorls of 4-6, dissected into 8-10 pairs of narrow segments from a central axis following the midrib.

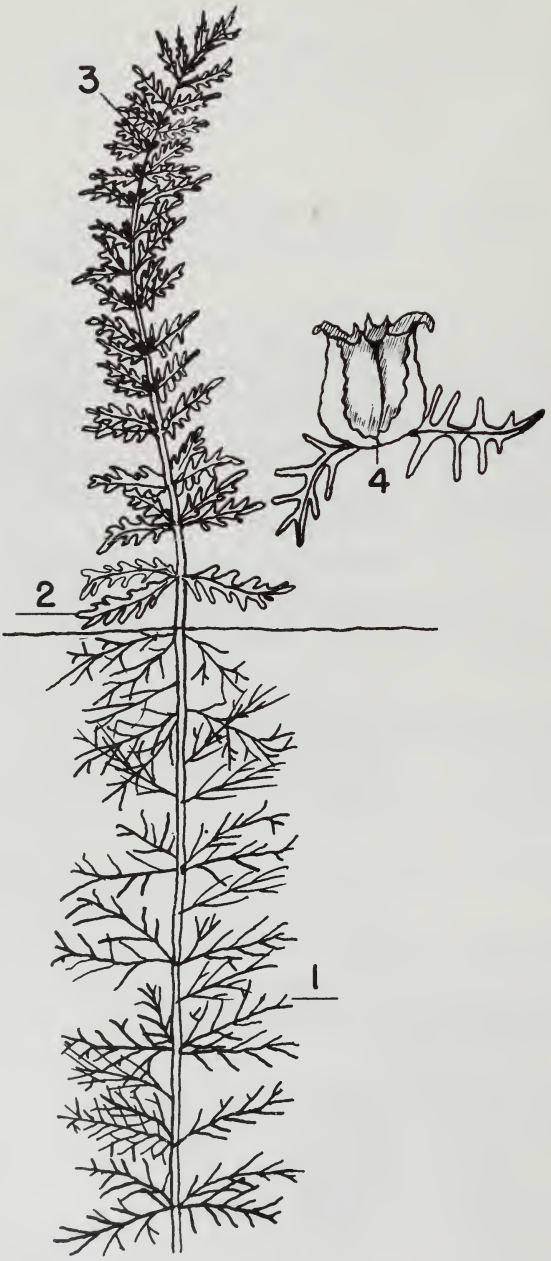
2. Emersed leaves (bracts), if present, 0.5 - 3 cm long, in whorls, margins serrate or toothed.

3. Flowering spikes 15 cm or more long, emersed. Flowers whorled, sessile, in axils of leaf-like bracts.

4. Fruit 1.5-2 mm long, sessile, each lobe with 2 ridges and a prominent beak, leafy bracts at the base. Drawing enlarged 15 times.

July - September. In quiet water of lakes and ponds.

Distribution: In scattered areas throughout the state.



VARIABLE WATER MILFOIL

Myriophyllum pinnatum (Walt.) BSP.

1. Submersed leaves 1-4 cm long, in whorls of 3-5, or some scattered, dissected into 5 pairs of narrow segments from a central axis following the midrib.

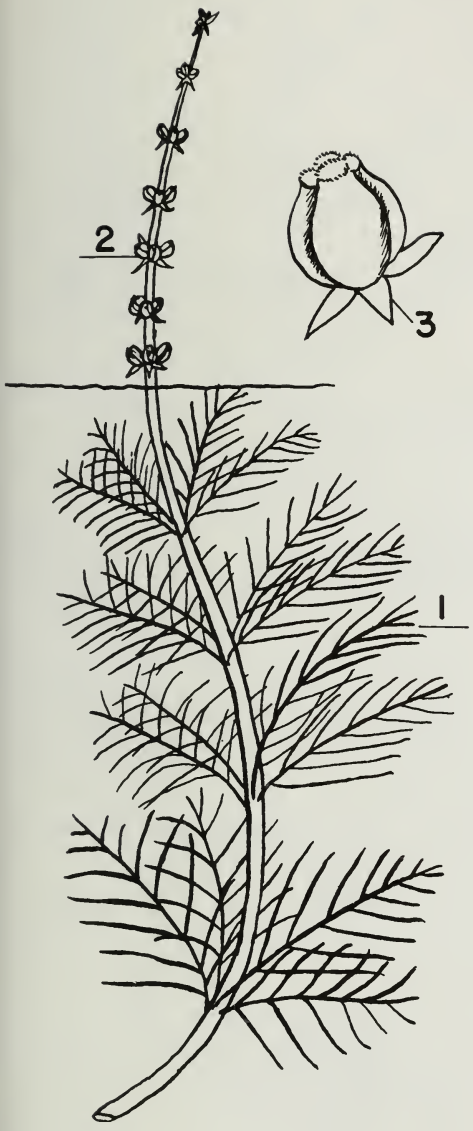
2. Emersed leaves (bracts), when present, 0.5 - 2 cm long, serrate or pectinate.

3. Flowering spikes 5 - 15 cm long, emersed. Flowers small, whorled, in axils of leaf-like bracts which are up to 1.5 cm long.

4. Fruit 1.5 - 2 mm long, sessile, 4-lobed, sides flat each with 2 ridges bearing tubercles, bracts deeply lobed. Drawing enlarged 9 times.

July - September. In quiet water of lakes and ponds.

Distribution: Western part of the state.



NORTHERN WATER MILFOIL

Myriophyllum exalbescens Fern.

1. Submersed leaves 1.5 - 3 cm long, in whorls of 3, 4 or 5, dissected into 6-10 pairs of narrow segments from a central axis following the midrib.

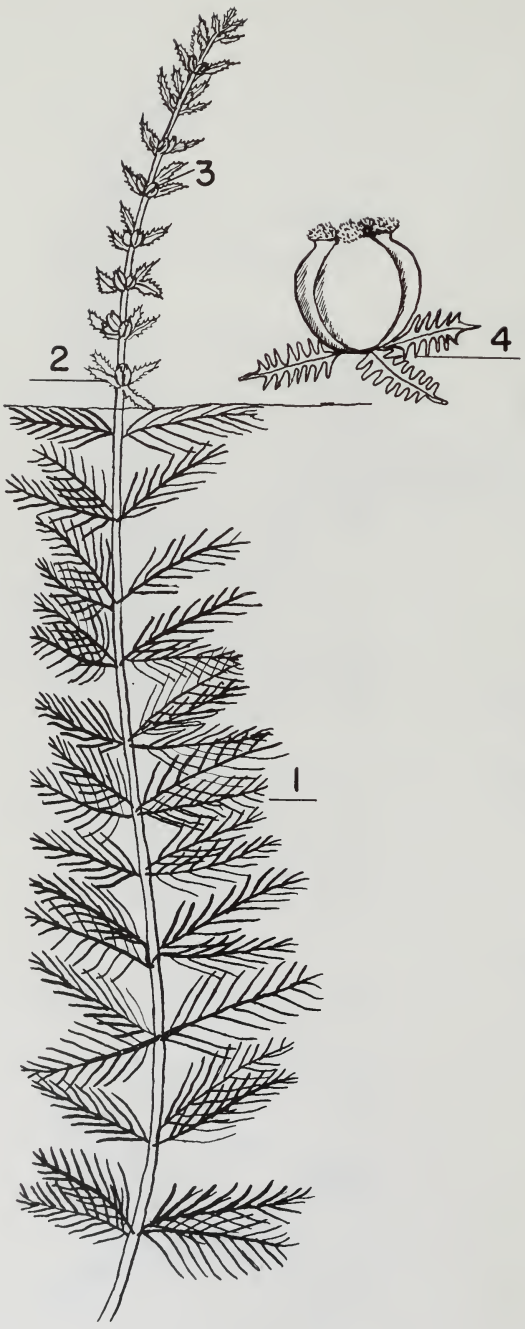
Emersed leaves bract-like, if present.

2. Flowering spikes 5-10cm long, emersed. Flowers whorled, sessile, very small, in axils of leaf-like bracts shorter than the flowers. Upper flowers staminate (male), lower pistillate (female).

3. Fruit 2 - 3 mm long when mature, sessile, 4-lobed, hard, round on the back, in whorls on the emersed part of the stem, bracts shorter than the fruit. Drawing enlarged 9 times.

July - September. In quiet water of lakes and ponds.

Distribution: Northern half of the state.



WHORLED WATER MILFOIL

Myriophyllum verticillatum L.

1. Submersed leaves 0.5 - 5 cm long, in whorls of 4-5, dissected into 9-15 pairs of narrow segments from a central axis.

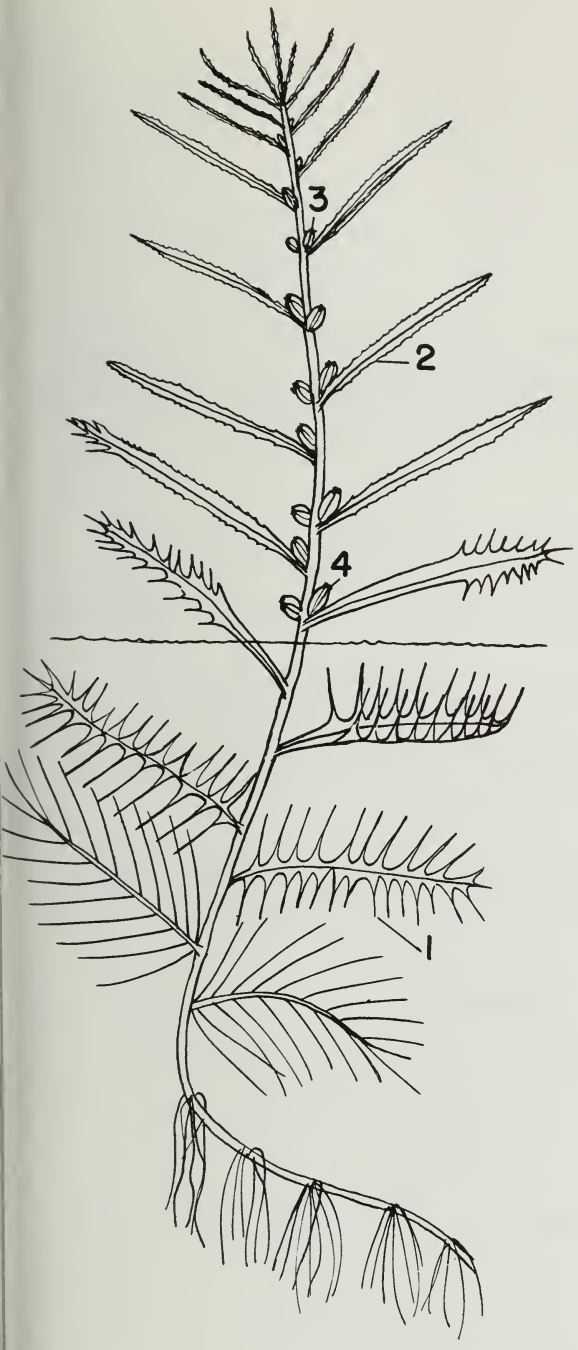
2. Emersed leaves (bracts), if present, reduced in size upward, dentate or toothed, smaller than the submersed leaves.

3. Flowering spikes 5-12 cm long. Flowers small, whorled, in axils of deeply divided bracts longer than the flowers.

4. Fruit 2-3 mm long, sessile, 4-lobed, round and smooth. Drawing enlarged 8 times.

July - September. In quiet water of lakes and ponds.

Distribution: May occur throughout the state.



MARSH MERMAID WEED

Proserpinaca palustris L.

1. Submersed leaves 1.5 - 4 cm long, alternate, sessile, deeply divided with 8-14 pairs of narrow segments.

2. Emersed leaves 2 - 7 cm long, 0.5 - 1.4 cm wide, serrate, the teeth curving upward, often less apparently alternate than submersed leaves.

Stem up to 1 m long, erect, entirely terrestrial or with lower part submersed.

3. Flowers very small, solitary or 2-3, in axils of upper leaves.

4. Fruit 3 - 4 mm long, 2 - 3 mm wide, hard, with 3 rounded angles.

July - September. Ponds, slowly moving water and along shores.

Distribution: In scattered localities throughout the state.

CALLITRICHACEAE (WATER-STARWORT FAMILY)

It is necessary to use a 10-power hand lens for accurate study of species of water-starwort. The flowers are very small and mature fruits are essential for study. These fruits are nut-like, flattened and borne in the axils of leaves.

Key to Species of *Callitriche*

1. Plants of damp or wet soil but not submersed or floating. Fruit deeply notched at both ends and on a short axillary peduncle. *Callitriche terrestris.* Not illustrated.

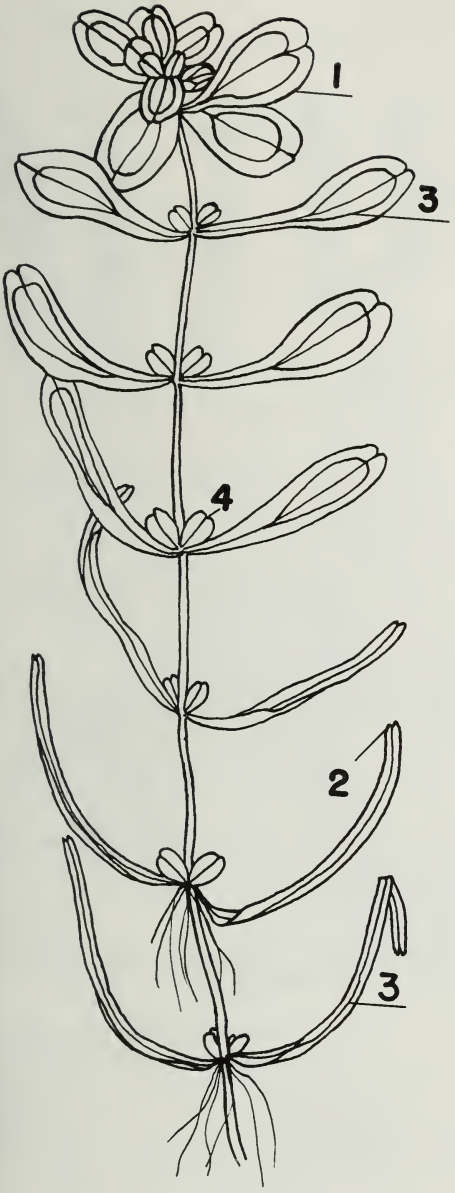
1. Plants aquatic, the stems submersed or floating, leaves longer than wide.

    2. Fruit sessile, in leaf axils, oval, longer than wide and tapering to the base. Floating leaves sometimes present. *Callitriche palustris.* Not illustrated.

    2. Fruit sessile, in leaf axils, nearly circular. Floating leaves, when present, spatula-shaped and crowded into a rosette. *Callitriche heterophylla.* Page 57.

REFERENCES

Gleason: Vol. 2, 491-492.
Fassett: 241-242.
Muenscher: 260-261.
Jones: 167.



WATER-STARWORT

Callitriche heterophylla Pursh

1. Floating leaves 5-10 mm long, spatula-shaped, crowded into a rosette.

2. Submersed leaves 5-10.5 mm long, opposite, sessile, entire, notched at the tips.

3. Veins of floating leaves 3-5, submersed leaves with 1 vein.

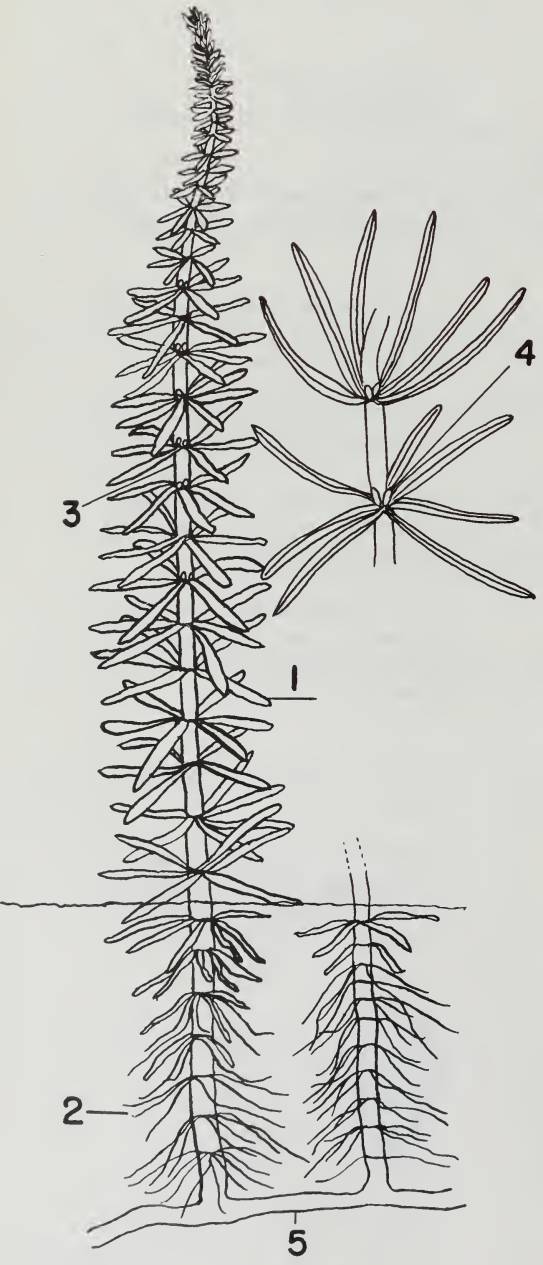
Flowers pistillate or staminate, very small, solitary or several in axils of submersed leaves.

4. Fruit about 1 mm long, small, notched, in leaf axils, round and divided into halves by a shallow groove.

July - September. Ponds and shallow water.

Distribution: Species of water-starwort are not common but may be found in suitable habitats throughout the state.

This family is represented by one genus, *Hippuris*, and its distribution is limited to northern Illinois. The genus, however, occurs in other parts of North America and Eurasia.



REFERENCES

Gleason: Vol. 2, 602-603.
Fassett: 262-263.
Muenscher: 278-279.
Jones: 167.

COMMON MARE'S TAIL

Hippuris vulgaris L.

1. Emersed leaves 0.5 - 3.5 cm long, simple, in whorls of 6-12.

2. Submersed leaves whorled, sometimes thread-like or thin and scale-like.

3. Stem 25 - 85 cm long, emersed, hollow, seldom branched, rooting below the surface of the water.

4. Flowers very small with neither sepals nor petals, sessile, in upper leaf axils of the emersed stem. Fruit 1.5 - 3 mm long, hard and nut-like. Drawing about natural size.

5. Rhizome.

June - September. Ponds and shallow water.

Distribution: Scattered in the northern part of the state.

There are nine genera representing this family in Illinois. One of them, *Dodecatheon*, includes the well known shooting-star. We have illustrated and described only American feather-foil (*Hottonia inflata* Ell.) which is of very limited occurrence and distribution in the southern part of the state. Other genera include species of wet areas and shallow water.

REFERENCES

Gleason: Vol. 3, 36-37.
Fassett: 278-279.
Muenscher: 300-301.
Jones: 179.

AMERICAN FEATHERFOIL

Hottonia inflata Ell.

1. Submersed leaves 2-7 cm long, scattered but more numerous at top of stem, deeply lobed or dissected.

Emersed leaves none.

2. Stem floating or rooted in soil, thickened and bearing leaves.

3. Flowers on emersed, thickened, segmented peduncles with constricted joints. Flowers small, white, in whorls at the joints, sessile or with short pedicels each with a leaf-like bract.

Seeds very small, numerous, in capsules.

July - September. Ponds and shallow water.

Distribution: Rare, found in extreme southern part of the state. Reported from southern Indiana.

This family, in Illinois, is represented by twenty-six genera. Several of these include species of wet ground or even shallow water. We have selected only *Bacopa* and *Veronica* and have illustrated and described one species in each genus.

Key to Genera and Species

Leaves generally round, opposite, sessile but not clasping, entire. Flowers axillary, single or paired and each on a short pedicel. *Bacopa rotundifolia*. Page 60.

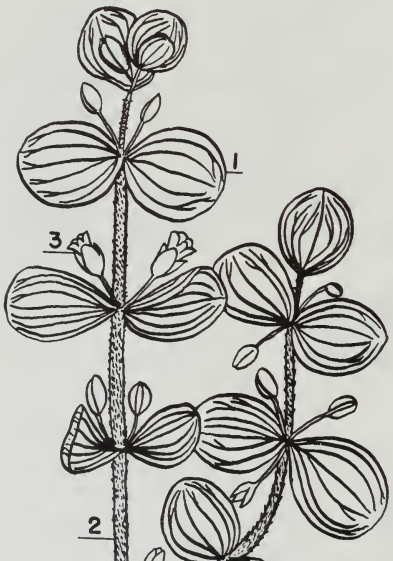
Leaves generally longer than wide, opposite, sessile, the bases clasping, margins with shallow teeth. Flowers in axillary racemes. *Veronica catenata*. Page 61.

REFERENCES

Gleason: Vol. 3, 208-210, 232-237.
Fassett: 300-308.
Muenscher: 308 and 310, 318-319.
Jones: 196-204.

WATER HYSSOP

Bacopa rotundifolia (Michx.) Wettst.



1. Emersed or submersed leaves 2 - 3.5 cm long, opposite, nearly round, thin, narrowed at the base, clasping the stem, sessile.

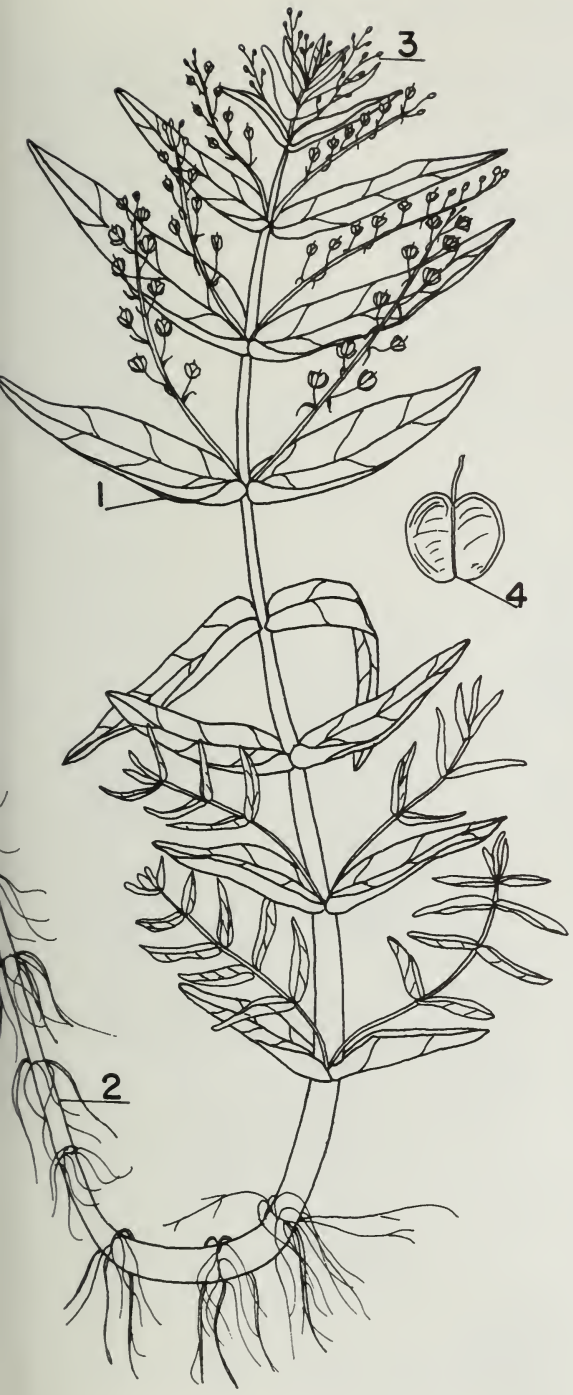
2. Stem submersed, floating or with leafy tips emersed, pubescent with fine hairs. Plants forming mats on muddy shores or in shallow water.

3. Flowers 8 - 10 mm long, white, on slender pedicels 1 - 2 cm long, from upper leaf axils.

4. Fruit a globular capsule up to 5 mm long.

July - September. Shallow water and muddy shores.

Distribution: Southern two-thirds of the state.



TUFTED WATER SPEEDWELL

Veronica catenata Pennell

1. Emersed leaves 1.5 - 2 cm wide and up to 4 times as long, sessile and clasping at the base, margins entire or with a few shallow teeth. Submersed leaves thin.

2. Stem creeping in shallow water, branched, often rooting at lower nodes, submersed stems often soft and flabby.

3. Flowers 4 - 5 mm wide, small, white or lilac, numerous, 20-60 in a raceme, from upper leaf axils. Each flower on a separate pedicel.

4. Fruit a capsule 3.5-5mm wide, notched at the top. Drawing enlarged 3 times.

June - September. Ditches, ponds and muddy shores.

Distribution: Northern half of the state.

Three genera of this family are found in Illinois. We have described and illustrated one of the two species of the genus *Dianthera* (water-willow). The other genera are not aquatic.

REFERENCES

Gleason: Vol. 3, 266-267.
Fassett: 313-314.
Muenscher: 329-330.
Jones: 205.

AMERICAN WATER-WILLOW
Dianthera americana L.

1. Leaves 8-15 cm long, 8-25mm wide, opposite, tapering at both ends, sessile, smooth, the margins entire.

2. Stems 45-100 cm long, smooth, with few branches, rooting at lower nodes which are often swollen.

Rhizomes, from which stems arise, buried in mud. Plants often forming colonies.

3. Flowers in spike-like heads 1-3.5 cm long, pale purple or white with purple markings.

4. Peduncle 4.5 - 15 cm long, slender, stiff, from upper leaf axils.

June - August. Shallow water and muddy shores.

Distribution: Probably state wide.

There are five species of bladderwort listed in the FLORA OF ILLINOIS. The following will assist in identification of two species illustrated in this manual.

Key to Species of *Utricularia*

Leaves forked and dissected into many narrow segments. Stems 1 - 2.5 m long, often densely leafy at the tips. Bladders or traps numerous. Flowers 4-15, yellow. *Utricularia vulgaris*. Page 63 .

Leaves generally 2-branched or forked, segments thread-like. Stems 10-12 cm long, not densely leafy at the tips. Bladders not numerous. Flowers 1-3, yellow. *Utricularia gibba*. Page 64 .

REFERENCES Gleason: Vol. 3, 259-263. Muenscher: 320-329.
Fassett: 309-313. Jones: 207-208.

COMMON BLADDERWORT

Utricularia vulgaris L.

1. Leaves 1 - 3.5 cm long with no main veins, forked and dissected into many narrow segments.

2. Leafy stem bearing numerous small bladders or traps. Drawing about natural size.

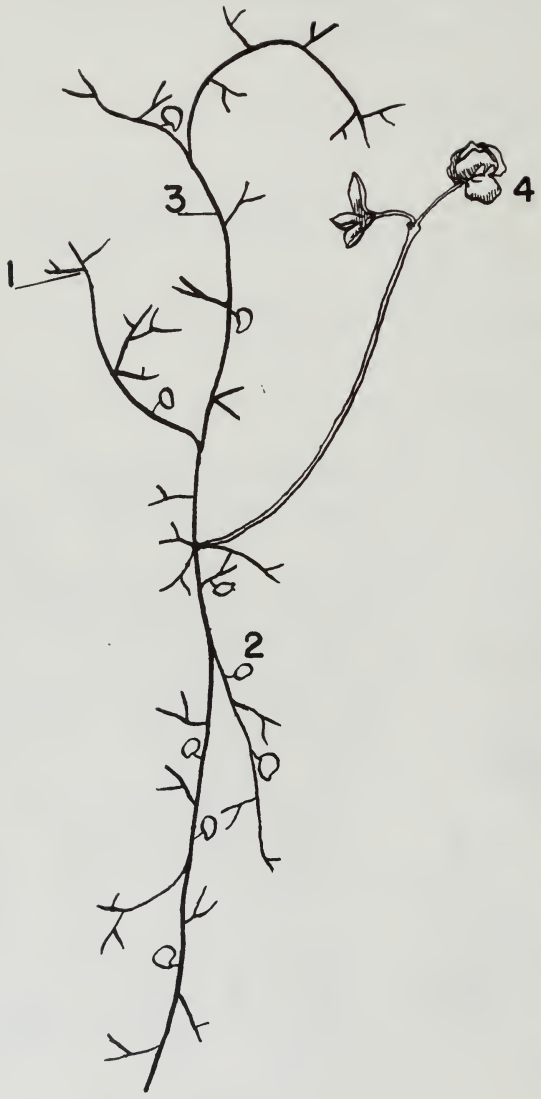
3. Stems 1 - 2.5 m long, growing just below the water surface, branched, often densely leafy at branch tips.

Flowers 4-15, yellow, lipped, the lips 10 - 17 mm long, each flower with a small bract below its pedicel, scape supporting the flower 10-85 cm long.

Fruit a capsule. As capsules mature the pedicels curve strongly downward.

July - September. Ponds and slowly moving streams.

Distribution: Northern half of the state.



HUMPED BLADDERWORT
Utricularia gibba L.

1. Leaves scattered, about 5 - 6 mm long, generally 2-branched or forked, segments thread-like and bearing a few bladders or traps.

2. Bladder or trap.

3. Stems 10-12cm long, delicate, not densely leafy as in *Utricularia vulgaris*.

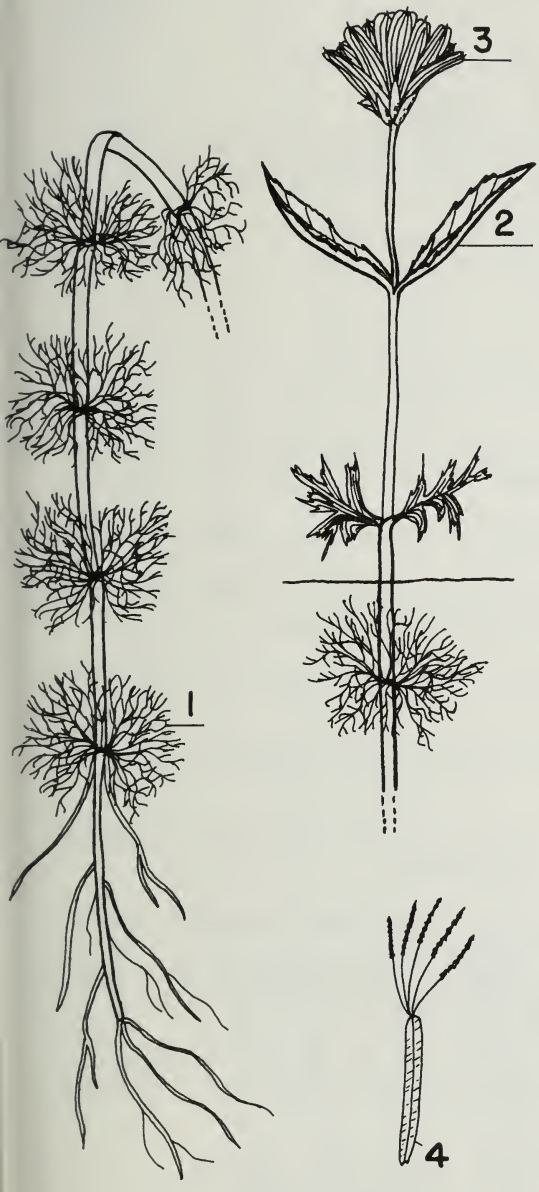
4. Flowers 1-3, yellow, 5.5-6 mm long, the leafless peduncle (scape) 2.5-9cm long and very slender.

Fruit a capsule 2.5 - 3 mm thick.

July - September. Ponds and slowly moving streams.

Distribution: Scattered localities throughout the state.

The thousands of plants included in the Compositae make it one of the largest plant families. There are seventy-three genera of the family represented in Illinois. Many species may grow in wet soil but the family is not notably aquatic in our area. We have mentioned only the genus *Bidens* (beggar-ticks) represented by eleven species in Illinois. Many species in this genus are plants of wet ground but the one we have described and illustrated is entirely aquatic. References given below are for *Bidens* only.



REFERENCES

Gleason: Vol. 3, 353-357.
Fassett: 325-336.
Muenscher: 335-336.
Jones: 262-263.

BUR-MARIGOLD

Bidens beckii Torr.

1. Submersed leaves crowded at nodes and appearing whorled, finely dissected into thread-like segments, soft in texture.

2. Emersed leaves 2 - 3.5 cm long, firm in texture, simple, sessile, the margins serrate or toothed.

3. Flowers in a single head, the central disk about 1 cm wide, with showy yellow rays up to 1.5 cm long.

4. Achenes 10-15 mm long, in clusters, with barbed awns. Drawing enlarged 2 times.

August - September. Ponds and slowly moving water.

Distribution: Northern part of the state.

In this family three genera are found in Illinois including two species of water plantain (*Alisma*), three of burhead (*Echinodorus*), and six of arrowhead (*Sagittaria*). We have illustrated and described one species in each genus, but a complete key for the arrowheads is included below.

Key to Genera of Alismaceae

1. Leaves arrowhead shaped with basal lobes or lanceolate with no lobes. Veins more than 7. Flowers in whorls of 3, the lower whorls pistillate, the upper staminate. Fruits (achenes) with marginal wings. *Sagittaria*. Key below.

1. Leaves oval or cordate with no basal lobes. Veins 7 or less.

   2. Leaves oval, the base cordate or tapering to the petiole. Flowers small, very numerous, often in a large panicle exceeding the leaves. Fruits (achenes) in a flattened head. Individual achenes with no wings, ribbed on the curved back only. *Alisma*. Page 68.

   2. Leaves cordate. Flowers small, in whorls of 3-6. Achenes in a globular head. Individual achenes with no wings but evenly ribbed. *Echinodorus*. Page 69.

Key to Species of *Sagittaria*

1. Leaves arrowhead shaped, seldom lanceolate or linear.

   2. Fruiting pedicels thickened, generally curved downward. *Sagittaria calycinus*. Not illustrated.

   2. Fruiting pedicels not thickened, not curved down but upward or spreading.

      3. Bracts in the inflorescence oval to ovate; beak of the achene nearly horizontal. *Sagittaria latifolia*. Page 67.

      3. Bracts in the inflorescence lanceolate, longer than wide; beak of the achene upright or erect.

         4. Achenes about 2 mm long with equal, thickened wings. *Sagittaria cuneata*. Not illustrated.

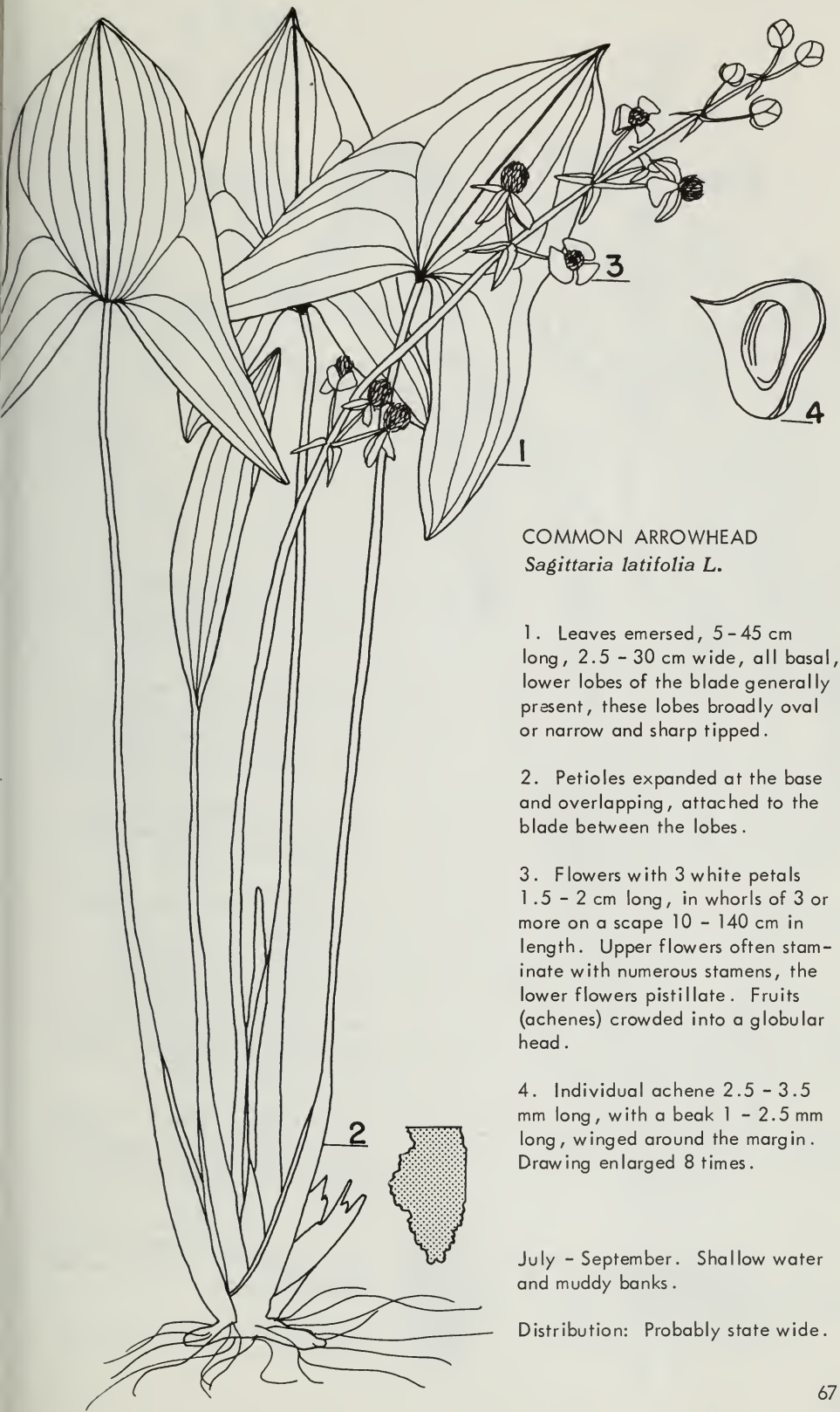
         4. Achenes about 3 mm long with unequal, thin wings. *Sagittaria brevirostra*. Not illustrated.

1. Leaves lanceolate (long and narrow) or linear, seldom arrowhead shaped.

   5. Achenes about 3 mm long, pedicels of flowers short; those of the pistillate flowers almost sessile. *Sagittaria rigida*. Not illustrated.

   5. Achenes about 2 mm long, pedicels long and slender; those of both pistillate and staminate flowers about the same length. *Sagittaria graminea*. Not illustrated.

REFERENCES Gleason: Vol. 1, 88-93. Muenscher: 78-95.
Fassett: 79-96. Jones: 274-275.



COMMON ARROWHEAD
Sagittaria latifolia L.

1. Leaves emersed, 5 - 45 cm long, 2.5 - 30 cm wide, all basal, lower lobes of the blade generally present, these lobes broadly oval or narrow and sharp tipped.

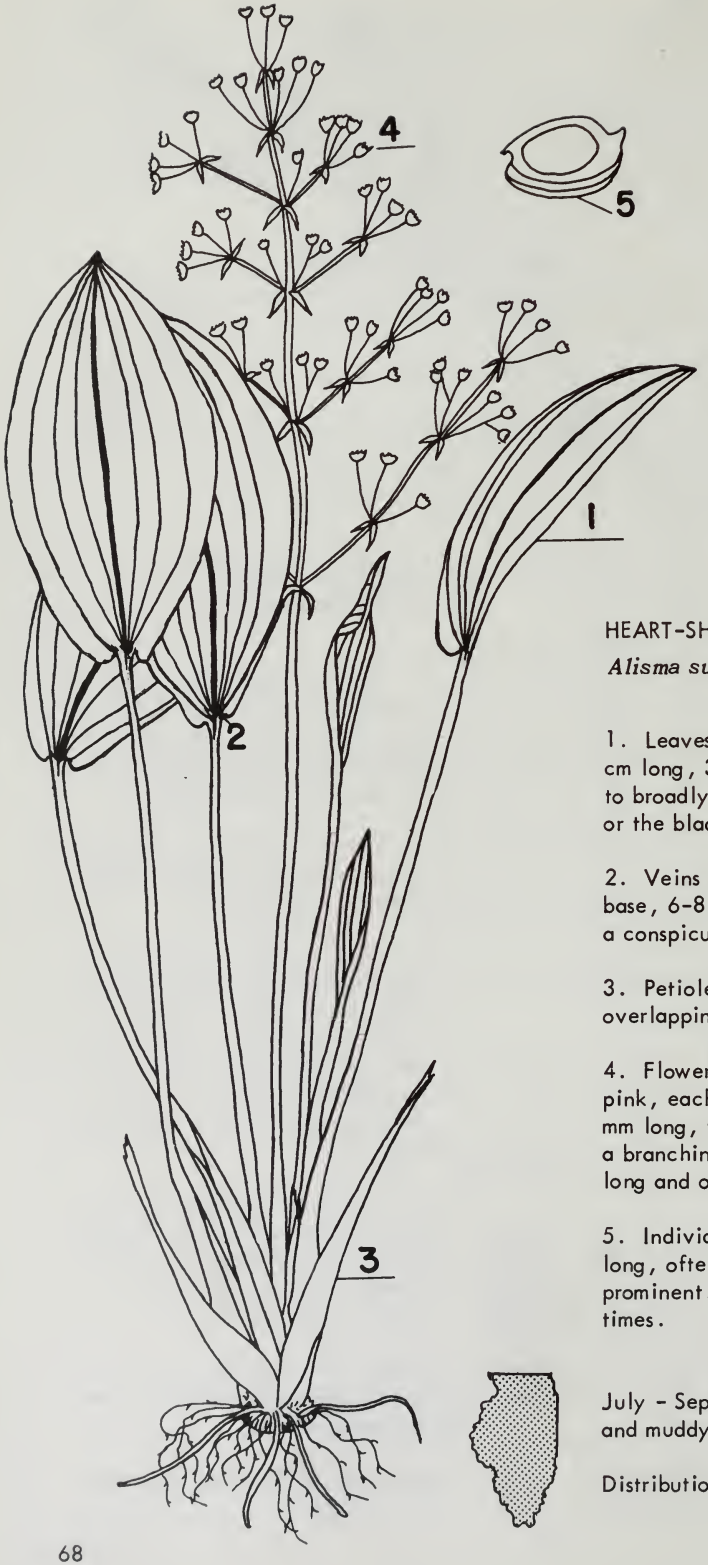
2. Petioles expanded at the base and overlapping, attached to the blade between the lobes.

3. Flowers with 3 white petals 1.5 - 2 cm long, in whorls of 3 or more on a scape 10 - 140 cm in length. Upper flowers often staminate with numerous stamens, the lower flowers pistillate. Fruits (achenes) crowded into a globular head.

4. Individual achene 2.5 - 3.5 mm long, with a beak 1 - 2.5 mm long, winged around the margin. Drawing enlarged 8 times.

July - September. Shallow water and muddy banks.

Distribution: Probably state wide.



HEART-SHAPED WATER PLANTAIN

Alisma subcordatum Raf.

1. Leaves emersed, basal, 5 - 20 cm long, 3 - 15 cm wide, elliptical to broadly oval, leaf blade cordate or the blade tapering to the petiole.

2. Veins arising from the leaf base, 6-8 main veins parallel to a conspicuous midrib.

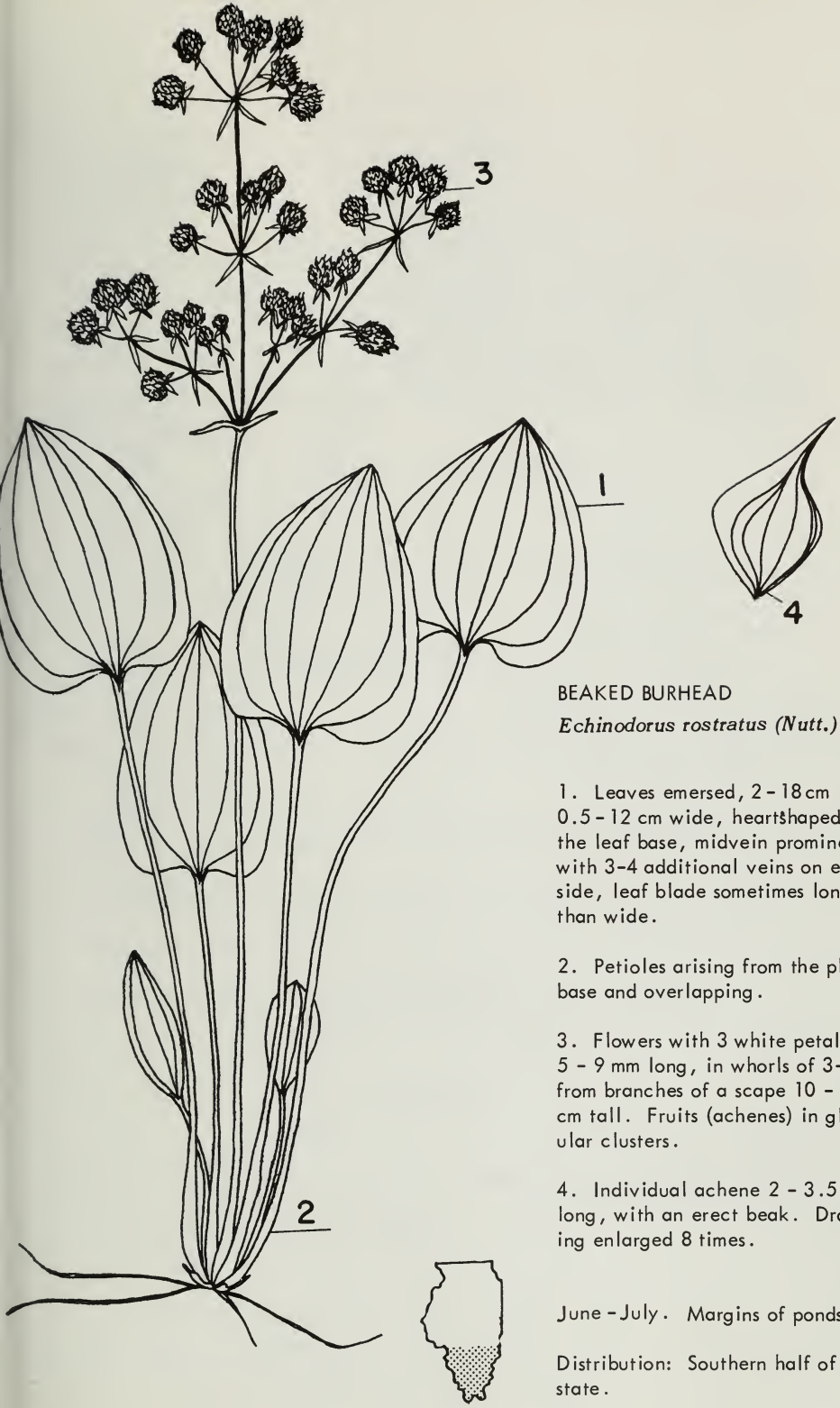
3. Petioles basally expanded and overlapping.

4. Flowers numerous, white to pink, each with 3 petals 1 - 2.5 mm long, very small, arranged in a branching panicle up to 100 cm long and often conspicuous.

5. Individual achenes 1 - 2.5 mm long, often numerous, beaks not prominent. Drawing enlarged 8 times.

July - September. Ditches, ponds and muddy banks.

Distribution: Probably state wide.



BEAKED BURHEAD

Echinodorus rostratus (Nutt.) Engelm.

1. Leaves emersed, 2 - 18 cm long, 0.5 - 12 cm wide, heart-shaped at the leaf base, midvein prominent with 3-4 additional veins on either side, leaf blade sometimes longer than wide.

2. Petioles arising from the plant base and overlapping.

3. Flowers with 3 white petals 5 - 9 mm long, in whorls of 3-6, from branches of a scape 10 - 50 cm tall. Fruits (achenes) in globular clusters.

4. Individual achene 2 - 3.5 mm long, with an erect beak. Drawing enlarged 8 times.

June - July. Margins of ponds.

Distribution: Southern half of the state.

NAJADACEAE (NAIAD FAMILY)

Identification of most of our species of *Najas* can be accomplished only with careful study. Often it will be necessary to dissect or unroll the leaf base under magnification. One can soon learn to recognize *Najas marina* and *N. minor* but *N. gracillima*, *N. flexilis* and *N. guadalupensis* will require patient study before they can be identified accurately in the field without a microscope or good lens.

Key to Species of *Najas*

1. Leaf blade visibly toothed, each tooth ending in a minute, spine-like tip.

    2. Teeth of blade triangular, easily visible without magnification. Base rounded, entire or with 1-2 teeth. *Najas marina*. Page 71 .

    2. Teeth of the blade barely visible without magnification. The base abruptly and broadly expanded with prominent spine-like bristles. *Najas minor*. Page 72 .

1. Leaf blade apparently entire but with very minute marginal spines not visible without magnification.

    3. Leaf blade abruptly expanded at the base, the lobes of the expanded portion with irregular (erose) margins. *Najas gracillima*. Page 73 .

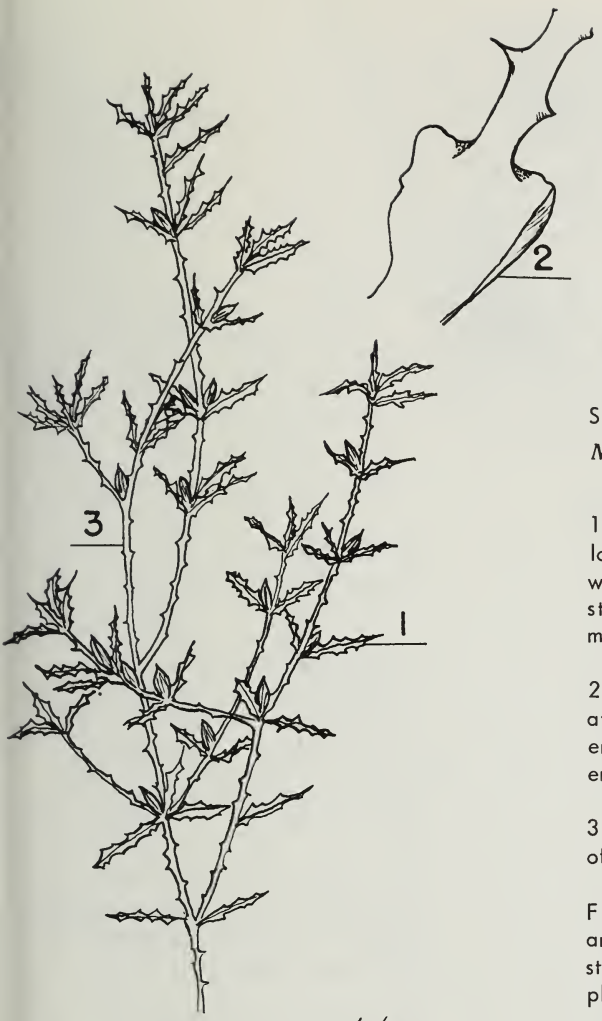
    3. Leaf blade with triangular or rounded bases, not abruptly expanded.

        4. Leaf blade tapering to a very fine tip. *Najas flexilis*. Page 74 .

        4. Leaf blade with a rounded tip, at least neither slender nor tapering to a fine tip. *Najas guadalupensis*. Page 75 .

REFERENCES

Gleason: Vol. 1, 85-86.
Fassett: 76-77.
Muenscher: 65-70.
Jones: 276.



SPINY NAIAD

Najas marina L.

1. Leaves submersed, 1-3 cm long, 2-5 mm wide, opposite or with several crowded together, stiff, bright green, triangular marginal teeth easily visible.

2. Leaf base rounded, sheathing, attached directly to the stem, entire or with 1-2 teeth. Drawing enlarged 8 times.

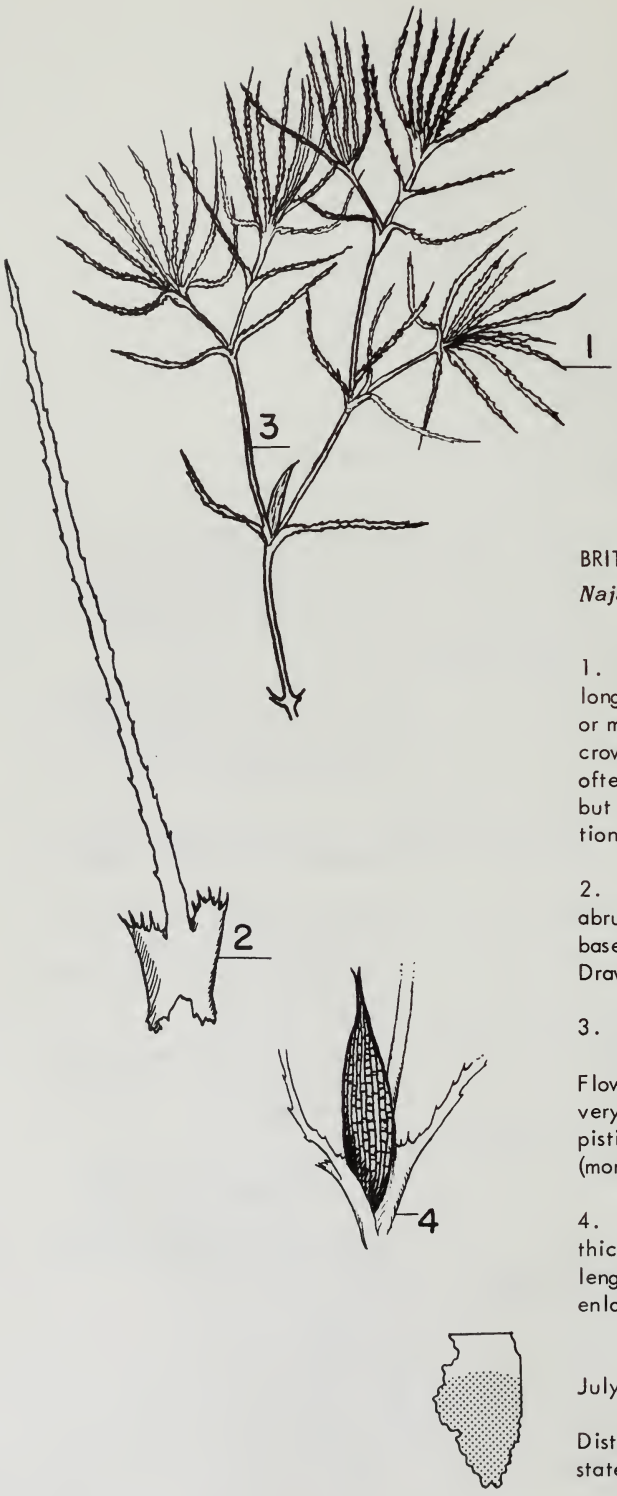
3. Stem stout, brittle, branching, often bearing spine-like teeth.

Flowers very small, in leaf axils and concealed by leaf bases, staminate and pistillate on separate plants (dioecious).

4. Fruit 4 - 7.5 mm long, half as thick, in leaf axils. Drawing enlarged 4 times.

August - October. Small lakes.

Distribution: Northern part of the state.



BRITTLE NAIAD

Najas minor All.

1. Leaves submersed, 1 - 2.7 cm long, less than 1 mm wide, opposite or more than 2 at a node, generally crowded at tips of branches, stiff, often recurved, spines very small but often visible without magnification.

2. Leaf with the narrow blade abruptly expanded at the clasping base into lobes with fine spines. Drawing enlarged 5 times.

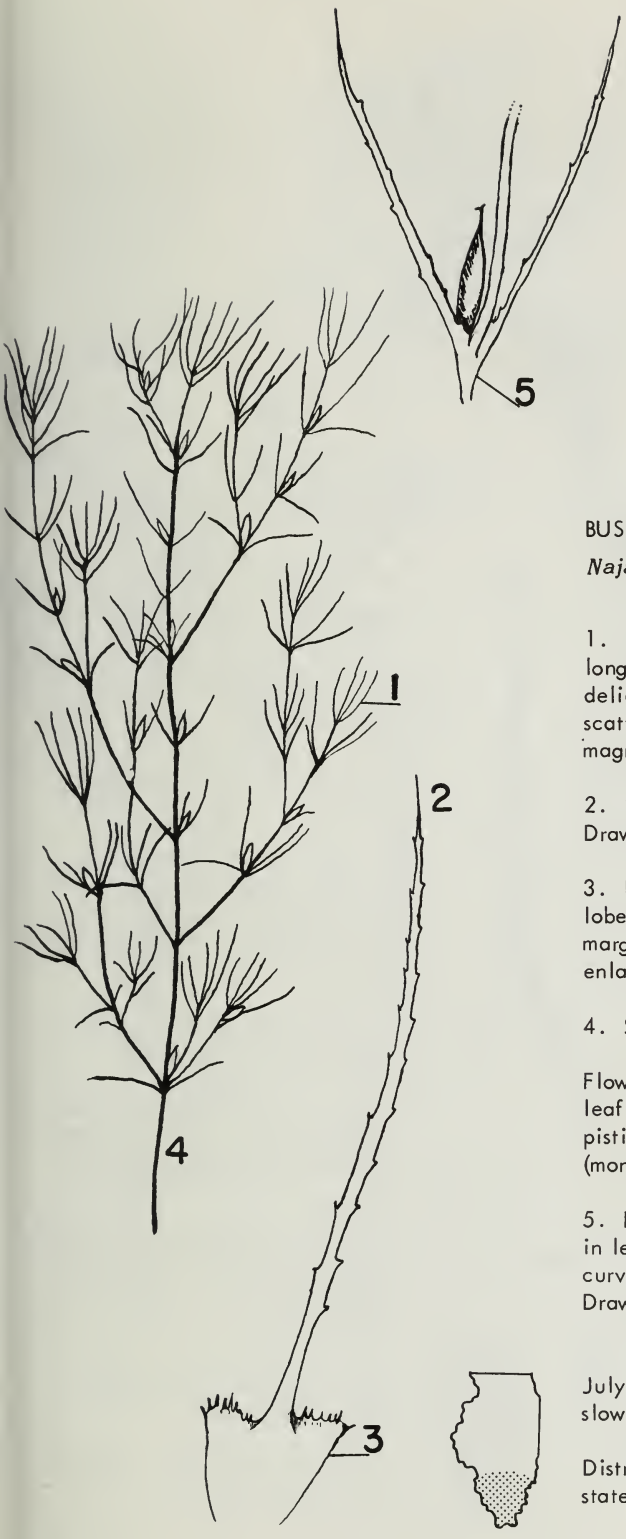
3. Stem slender and branched.

Flowers concealed in leaf axils, very small, separate staminate and pistillate flowers on the same plant (monoecious).

4. Fruit 2 - 4 mm long, 0.6 mm thick, with 12-15 ribs extending lengthwise, in leaf axil. Drawing enlarged 4 times.

July - September. Ponds.

Distribution: Southern half of the state.



BUSHY NAIAD

Najas gracillima (A. Br.) Magnus.

1. Leaves submersed, 1 - 3.5 cm long, barely 0.3 mm wide, slender, delicate, opposite or appearing scattered, marginal spines require magnification.

2. Leaf tip slender and tapering. Drawing enlarged 5 times.

3. Leaf base sheathing, abruptly lobed, the lobes with irregular margins and fine spines. Drawing enlarged 5 times.

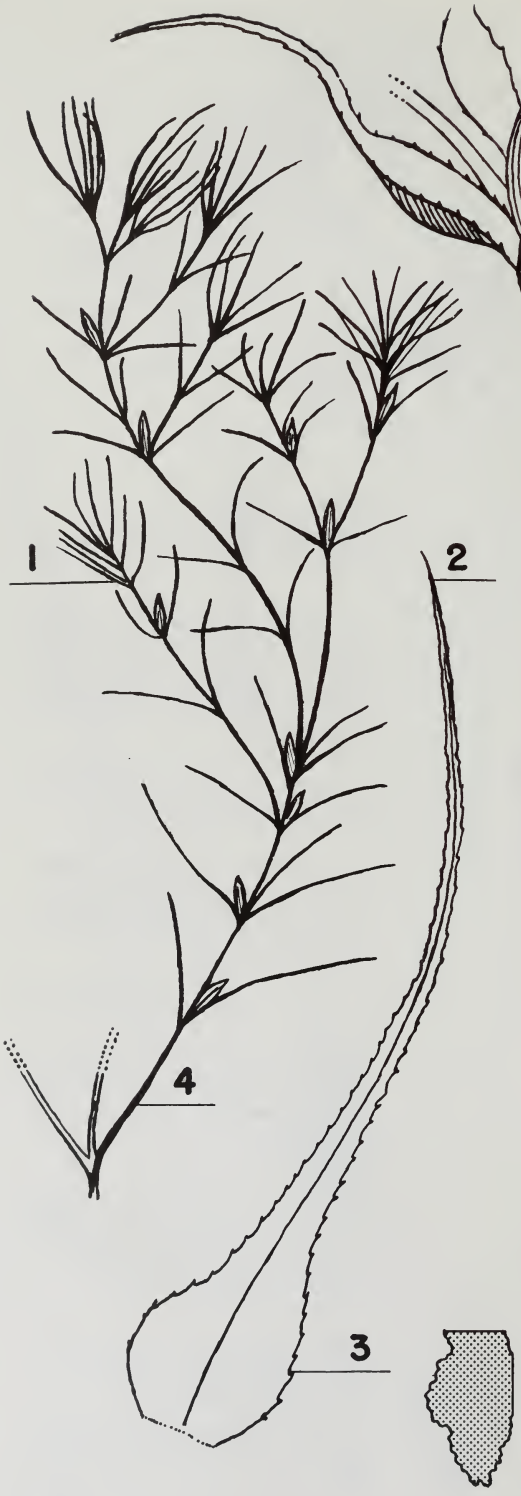
4. Stem very slender and delicate.

Flowers very small, concealed in leaf bases, separate staminate and pistillate on the same plant (monoecious).

5. Fruit 2 - 3.5 mm long, sessile, in leaf axils, dull in color, slightly curved or with unequal sides. Drawing enlarged 4 times.

July - September. Ponds and slowly moving water.

Distribution: Southern part of the state.



SLENDER NAIAD

Najas flexilis (Willd.) R. & S.

1. Leaves submersed, 1-3.5 cm long, 0.3 - 2 mm wide, slender, tapering to a fine point, often crowded at branch tips, margin with very fine spines requiring magnification.

2. Leaf tip. Drawing enlarged 5 times.

3. Leaf base sheathing and rounded, expanded but not abruptly lobed, marginal spines very small. Drawing enlarged 5 times.

4. Stem slender, often reddish-brown, branches numerous.

Flowers in leaf axils, very small, pistillate in lower and staminate in upper branches (monoecious).

5. Fruit 2.5 - 3 mm long, 1.5 mm thick, slender, the pericarp yellow-purple, seed shiny. Drawing enlarged 8 times.

July - September. Ponds and slowly moving water.

Distribution: Scattered localities but probably state wide.

SOUTHERN NAIAD

Najas guadalupensis (Spreng.) Magnus.

1. All leaves submersed, 0.8-2 cm long, 0.5-0.8 mm wide, linear, dark green to purple-brown, tips rather blunt, smaller leaves often in axils of the larger. Marginal spines require magnification.
2. Leaf tip blunt or rounded, not tapering. Drawing enlarged 5 times.
3. Leaf base sheathing and rounded, expanded but not abruptly lobed, margin with very fine spines. Drawing enlarged 5 times.
4. Stem firm but not stiff.
5. Flowers concealed in leaf axils, very small, requiring magnification. Separate male and female flowers on the same plant (monoecious). Fruit 1.5-3 mm long, in leaf axils, dull purple-brown, the seed itself dull with almost square surface markings visible with a hand lens. Drawing enlarged 8 times.

July - September.

Ponds and slowly moving streams.

Distribution: Probably state wide.

Key to Genera

1. Leaves alternate or the upper sometimes crowded and appearing opposite, variable in shape.

    2. Plants with both floating and submersed leaves, often unlike in appearance, or plants entirely submersed. Stipules only partially attached to leaf bases or free. Flowers and fruits in elongate or globose spikes. *Potamogeton*. Key below.

    2. Plants entirely submersed, leaves all alike, long, narrow. Stipules sheathing the leaf bases. Flowers concealed in the leaf sheath until after flowering, the fruits eventually on a long peduncle. *Ruppia*. Page 99.

1. Leaves opposite or sometimes three or more, always thread-like and delicate. Flowers and fruits axillary, nearly sessile and curved. *Zannichellia*. Page 100.

REFERENCES

Gleason: Vol. 1, 74-86.
Fassett: 55-77.
Muenscher: 27-56, 59-61.
Jones: 276-278.

Key to Species of *Potamogeton*

1. Plants bearing both floating and submersed leaves, the floating ones broader than the submersed.

    2. Submersed leaves longer than wide, more than 5 mm wide.

        3. Stem and petioles with black or dark spots, floating leaves with heart-shaped or broadly rounded bases, submersed leaves with wavy margins. *P. pulcher*. Page 79.

        3. Stem and petioles with no black or dark spots, the leaves with tapering or round bases, margins not wavy.

            4. Floating leaves with 30-51 veins, submersed leaves folded and curved. *P. amplifolius*. Page 80.

4. Floating leaves with less than 30 veins.

5. Submersed leaves with petioles 2 - 13 cm long. *P. nodosus*. Page 81 .

5. Submersed leaves sessile or with a tapering petiole less than 2 cm long.

6. Submersed leaves 1.5 - 8 cm long, sessile and with mature fruiting spikes 1 - 3 cm long. *P. gramineus*. Page 82 .

6. Submersed leaves 9 - 20 cm long, sessile or with a short tapering petiole; mature fruiting spikes from 4-6 cm long. *P. illinoensis*. Page 83 .

2. Submersed leaves linear or thread-like, less than or at least not more than 5 mm wide.

7. Submersed leaves 3 - 8 mm wide, linear, with 5-7 veins, floating leaves spatula-shaped, with 9-27 veins, fruiting spikes cylindrical and all similar. *P. epihydrus*. Page 84 .

7. Submersed leaves 1 - 2 mm wide, thread-like.

8. Floating leaves 5 - 10 cm long; fruiting spikes all similar. *P. natans*. Page 85 .

8. Floating leaves up to 4 cm long.

9. Floating leaves 1 - 4 cm long; submersed leaf bases sheathing the stem; fruiting spikes of two kinds, the emersed ones cylindrical and the submersed ones globular. *P. diversifolius*. Page 86 .

9. Floating leaves 8 - 15 mm long, submersed leaf bases not forming a sheath around the stem; fruiting spikes all similar. *P. vaseyi*. Page 87 .

1. Plants entirely submersed, all leaves uniform in appearance.

10. Leaves not more than 5 mm wide, thread-like, ribbon-like, or linear (longer than wide).

11. Stipules free, not attached to petioles or blades.

12. Leaves with 9-35 veins. *P. zosteriformis*. Page 88 .

12. Leaves with 1-7 veins.

13. Leaves with 5-7 veins, a pair of small glands at the base of the blade. *P. friesii*. Page 89

13. Leaves with 1-5 veins.

14. Leaves with no small glands at the base of the blade. *P. foliosus*. Page 90.

14. Leaves with a pair of small glands at the base of the blade.

15. Leaves 3-veined, obtuse or tapering to sharp bristle tips. *P. strictifolius*. Page 91.

15. Leaves 3-veined with no bristle tip.

16. Peduncles of fruiting spikes 3 - 8 cm long, thread-like. *P. pusillus*. Page 92.

16. Peduncles of fruiting spikes 0.5 - 3 cm long, not thread-like. *P. berchtoldi*. Page 93.

11. Stipules attached to the base of petioles or blades.

17. Leaves coarsely thread-like, gradually tapering from base to tip, with no auricles (ears) at the base of the blade, margins entire. Plants appearing spray-like or fan-like in water. *P. pectinatus*. Page 94.

17. Leaves not coarsely thread-like but linear (longer than wide), bearing auricles (ears) at the base of the blade, margins very finely serrate. *P. robbinsii*. Page 95.

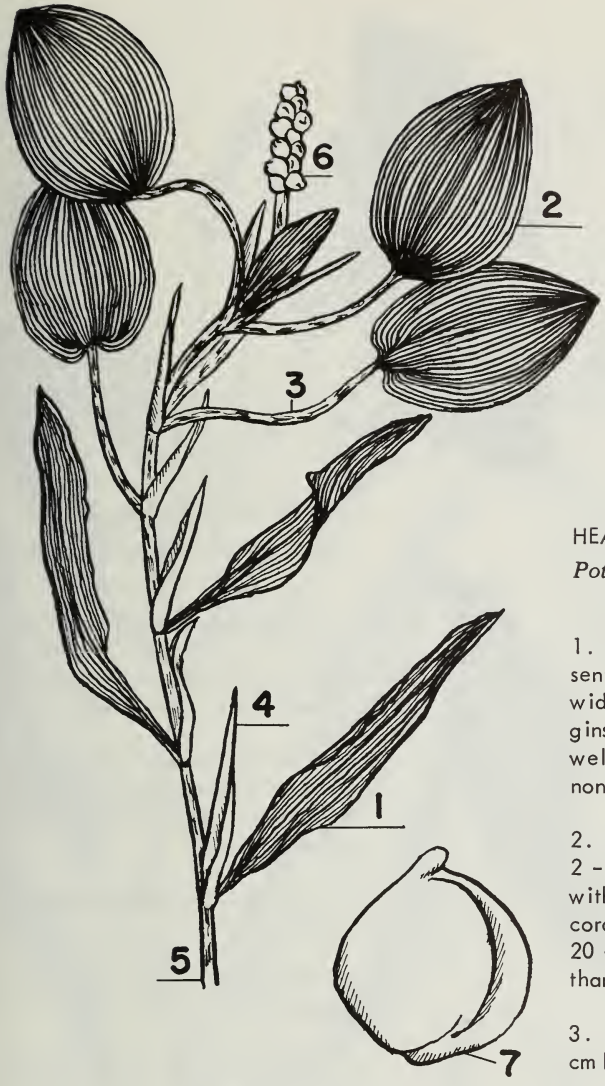
10. Leaves more than 5 mm wide, neither thread-like nor linear, but oval or lanceolate, sessile or clasping the stem.

18. Leaves sessile, round at the tips, margins crisped (wavy) and with very fine teeth. *P. crispus*. Page 96.

18. Leaves not sessile but with clasping bases.

19. Leaf blade 10 - 40 cm long, tips rounded and boat-shaped therefore splitting into an M-shape, margins flat. *P. praelongus*. Page 97.

19. Leaf blade 2 - 9 cm long, tips neither rounded nor boat-shaped but flat and tapering, the margins wavy or crinkly. *P. richardsonii*. Page 98.



HEARTLEAF PONDWEED

Potamogeton pulcher Tuckerm.

1. Submersed leaves, when present, 7 - 15 cm long, 1 - 3 cm wide, lanceolate, with wavy margins, tapering to the base with no well defined petiole. Veins 10-~~20~~, none more conspicuous than others.

2. Floating leaves 5 - 8 cm long, 2 - 5 cm wide, oval to elliptical, with sharp to rounded tips, bases cordate to broadly rounded. Veins 20 - 30, none more conspicuous than others.

3. Petioles of floating leaves 3-10 cm long, thick, often black spotted.

4. Stipules 3 - 6 cm long, tapering to a point, generally persisting.

5. Stem with few branches, often black spotted.

6. Peduncle 5 - 10 cm long, thicker than the stem. Fruits (achenes) in dense cylindrical spike 2 - 3.5 cm long.

7. Individual achene 3 - 4 mm long, oval, beaks generally present. Drawing enlarged 8 times.

June - August. Shallow water and muddy shores.

Distribution: Generally the northern half of the state.

LARGELEAF PONDWEED

Potamogeton amplifolius Tuckerm.

1. Submersed leaves 8 - 20 cm long, 3 - 5 cm wide, thin, often recurved, folded, rolled, tapering at each end. Veins 25-40.

2. Floating leaves 5 - 18 cm long, 3 - 5 cm wide, elliptical, rounded at the base. Veins 30-51 with 6-8 often prominent.

3. Petioles of submersed leaves 1-4 cm long.

4. Petioles of floating leaves 9-15 cm long.

5. Stipules 4 - 12 cm long, tapering to a sharp point, with two ridges on the back.

6. Stem 3 - 4 mm in diameter, sometimes with few branches.

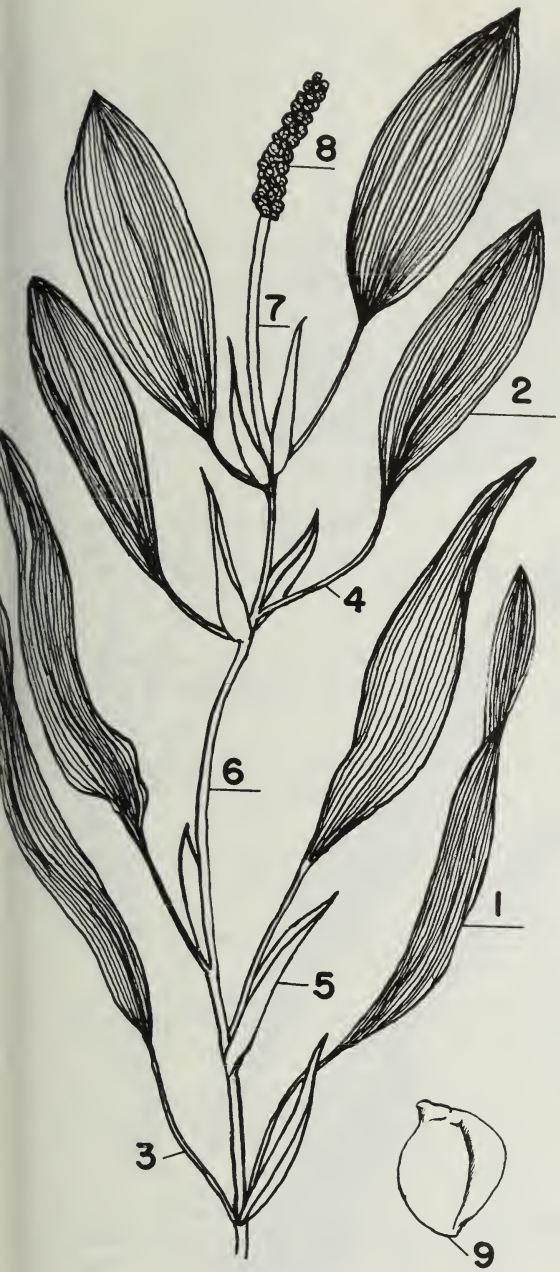
7. Peduncle 8 - 15 cm long, thicker than the stem.

8. Fruits (achenes) in dense spike 2 - 8 cm long.

9. Individual achene 3.5 - 5 mm long, often beaked. Drawing enlarged 5 times.

June - August. Ponds and lakes.

Distribution: Eastern and northeastern part of the state.



AMERICAN PONDWEED

Potamogeton nodosus Poir.

1. Submersed leaves 8-30 cm long, 1 - 3 cm wide, thin, lanceolate to linear, tapering to the base. Veins 7 - 15.

2. Floating leaves 5 - 13 cm long, 2 - 5 cm wide, thick in texture, oval, tips round to sharp, base round to tapered. Veins 11-21.

3. Petioles of submersed leaves 2 - 13 cm long.

4. Petioles of floating leaves 5 - 20 cm long.

5. Stipules 5 - 10 cm long, tapering to rounded tips, thin.

6. Stem round with few branches.

7. Peduncles 3-12 cm long, thicker than the stem.

8. Fruits (achenes) in cylindrical spike 3 - 6 cm long, dense with achenes.

9. Individual achene 3 - 4 mm long, keels sharp, beak short. Drawing enlarged 5 times.

June - August. Both shallow and deep water.

Distribution: Probably state wide.

VARIABLE PONDWEED

Potamogeton gramineus L.

1. Submersed leaves 1.5 - 8 cm long, 3 mm to 1 cm wide, narrow, tapering to the base, the tips sharp. Veins 3-7. All leaves quite variable.

2. Floating leaves 2 - 5 cm long, 1 - 2 cm wide, oval to elliptical, thick in texture. Veins 11 - 19. All leaves variable.

3. Petioles of submersed leaves none. Leaf blade tapering to the base.

4. Petioles of floating leaves 5-10 cm long, slender.

5. Stipules 2 - 2.5 cm long, tips rounded, persisting.

6. Stem round, slender, often with many branches.

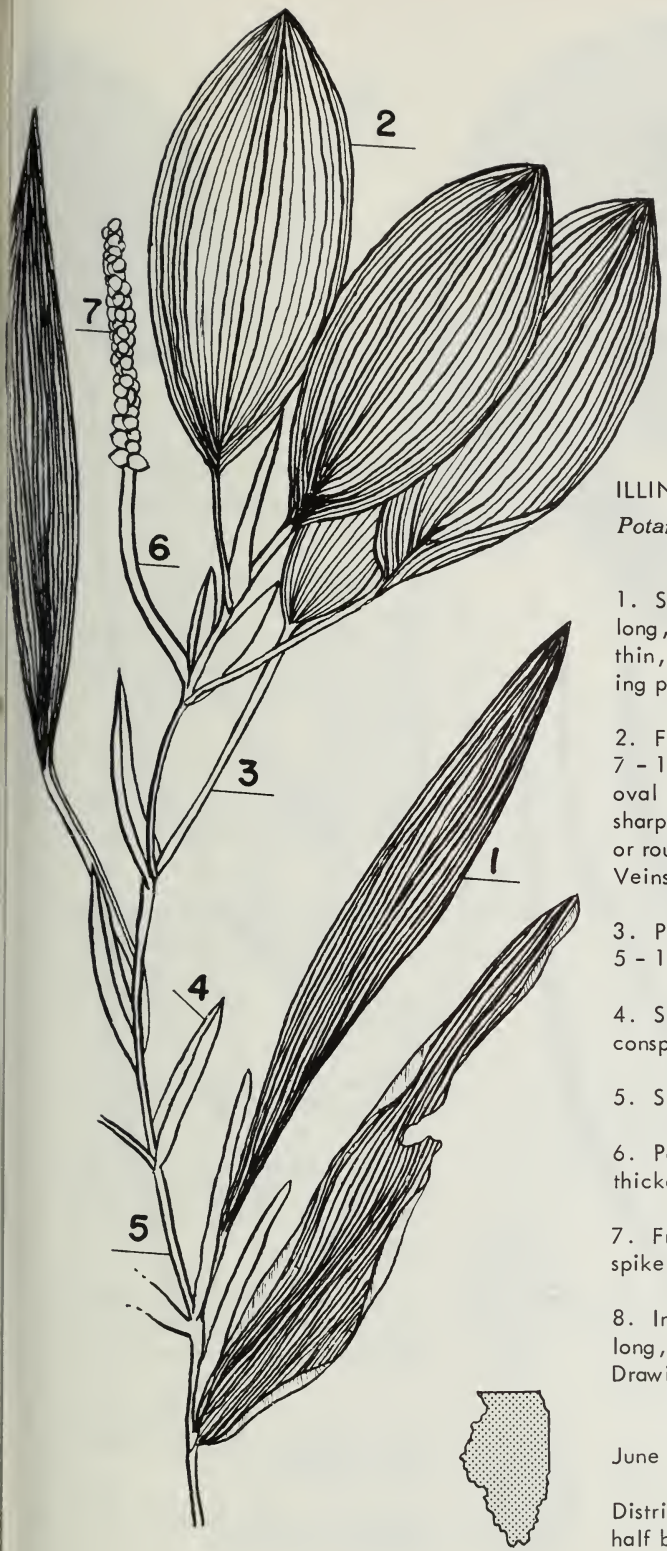
7. Peduncle 2 - 10 cm long, thicker than the stem.

8. Fruits (achenes) in spike 1 - 3 cm long, cylindrical, dense with achenes.

9. Individual achene 1.7 - 2.5 mm long, dorsal keel sharp, beak erect. Drawing enlarged 8 times.

June - August. Both shallow and deep, moving water.

Distribution: Eastern part of the state.



ILLINOIS PONDWEED

Potamogeton illinoensis Morong

1. Submersed leaves 9 - 20 cm long, 3.8 - 5 cm wide, lanceolate, thin, sessile or with a short, tapering petiole. Veins 9-19.

2. Floating leaves, when present, 7 - 13 cm long, 2 - 6 cm wide, oval to lanceolate, rounded to sharply tipped, the bases tapering or rounded, thick in texture. Veins 19 - 23.

3. Petioles of floating leaves 5 - 10 cm long.

4. Stipules 5 - 10 cm long, conspicuous and persisting.

5. Stem often stout and branching.

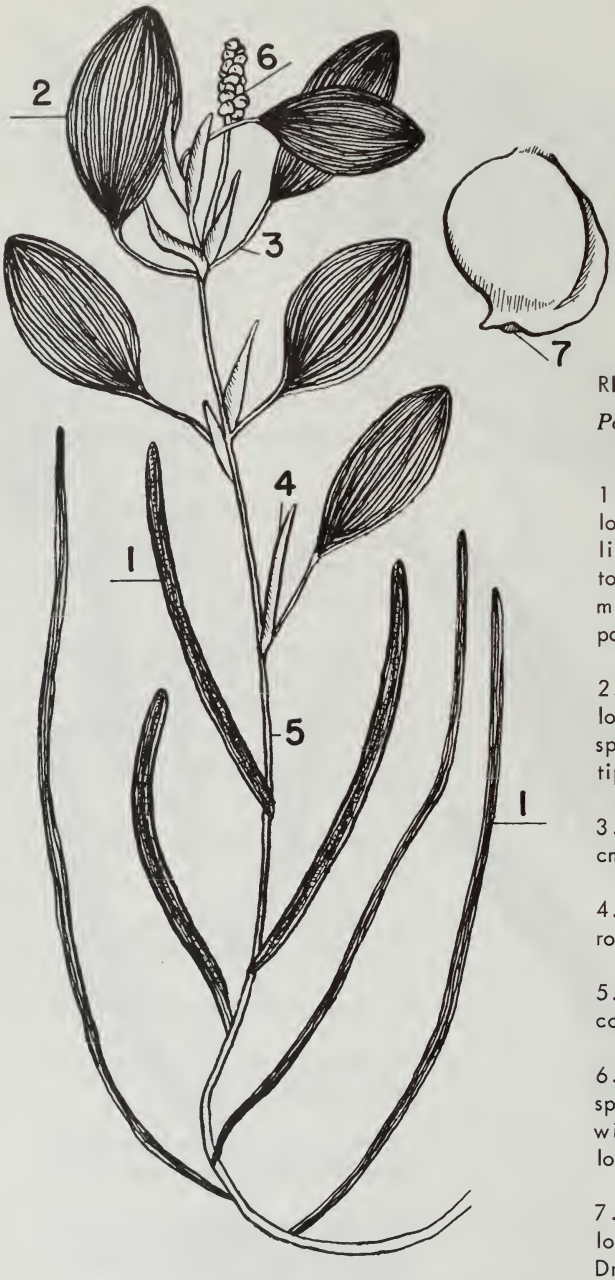
6. Peduncle 5 - 10 cm long, thicker than the stem.

7. Fruits (achenes) in cylindrical spike 6 cm long, dense with fruit.

8. Individual achene 3.5 - 4 mm long, low dorsal keels and beaks. Drawing enlarged 7 times.

June - August. In quiet water.

Distribution: Mostly the northern half but possibly state wide.



RIBBONLEAF PONDWEED

Potamogeton epihydrus Raf.

1. Submersed leaves 10-15 cm long, 3 - 8 mm wide, sessile, linear and tapering from the base to slender tips. Veins 5-7, the midvein with parallel bands of pale green.

2. Floating leaves 2 - 7.5 cm long, 7 - 20 mm wide, somewhat spatula-shaped, rounded at the tips. Veins 9-27.

3. Petioles of floating leaves 2-8 cm long, slender, often flattened.

4. Stipules 1.5 - 3 cm long, with rounded tips.

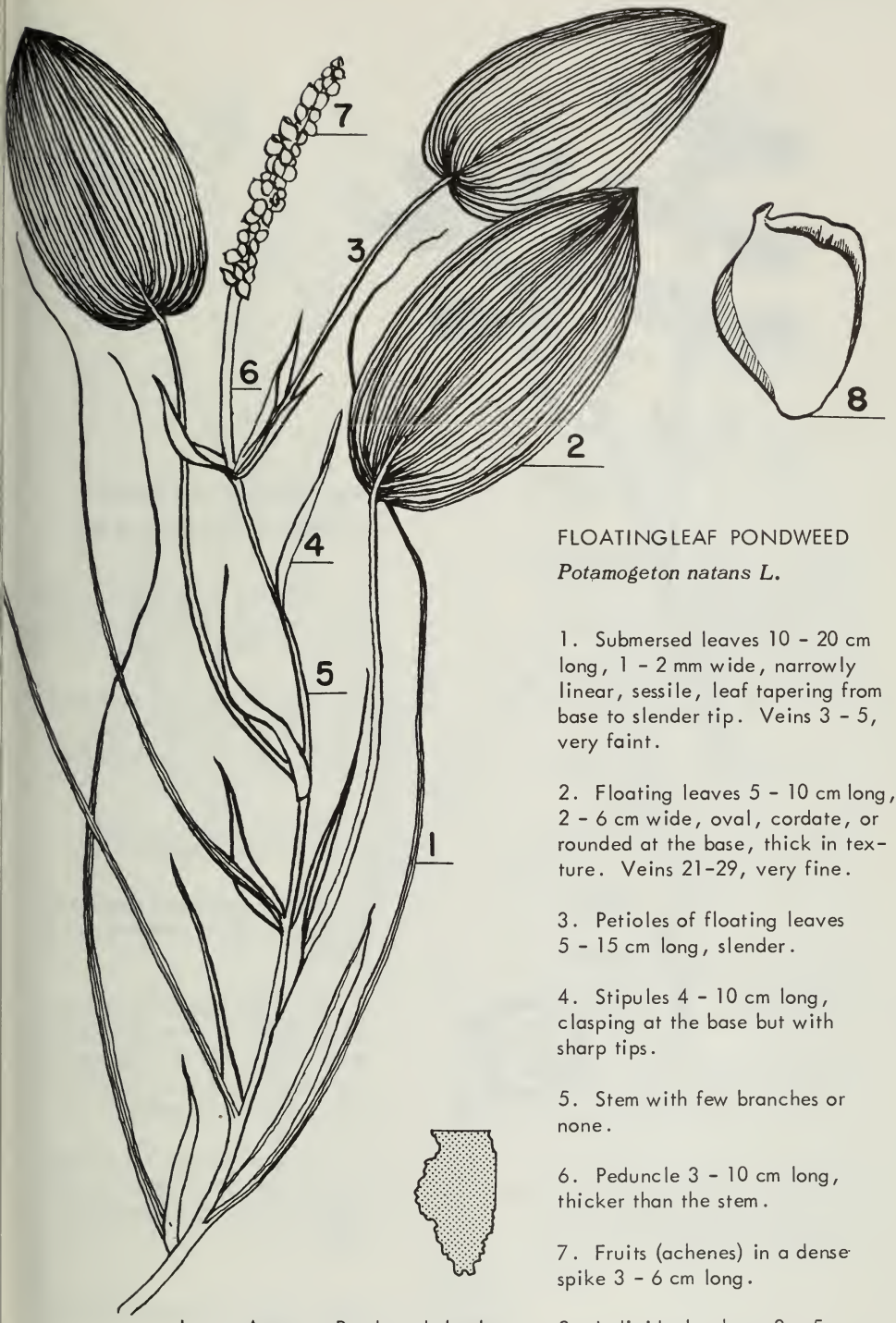
5. Stem slender, long, somewhat compressed, with few branches.

6. Fruits (achenes) in cylindrical spike 8 mm to 3 cm long and dense with achenes. Peduncle 2 - 6 cm long, slender.

7. Individual achene 2.5 - 4 mm long, with sharp dorsal keel. Drawing enlarged 10 times.

June - August. Ponds and slowly moving water.

Distribution: Not common but probably state wide.



FLOATINGLEAF PONDWEED

Potamogeton natans L.

1. Submersed leaves 10 - 20 cm long, 1 - 2 mm wide, narrowly linear, sessile, leaf tapering from base to slender tip. Veins 3 - 5, very faint.

2. Floating leaves 5 - 10 cm long, 2 - 6 cm wide, oval, cordate, or rounded at the base, thick in texture. Veins 21-29, very fine.

3. Petioles of floating leaves 5 - 15 cm long, slender.

4. Stipules 4 - 10 cm long, clasping at the base but with sharp tips.

5. Stem with few branches or none.

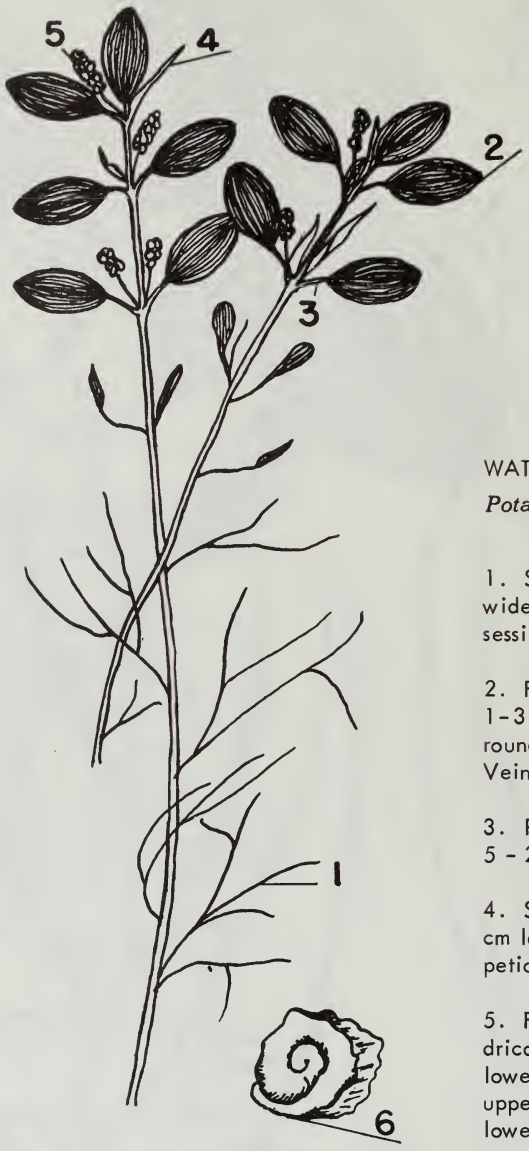
6. Peduncle 3 - 10 cm long, thicker than the stem.

7. Fruits (achenes) in a dense spike 3 - 6 cm long.

8. Individual achene 3 - 5 mm long, turgid or swollen, with no conspicuous keels. Drawing enlarged 8 times.

June - August. Ponds and slowly moving water.

Distribution: Probably state wide.



WATERTHREAD PONDWEED

Potamogeton diversifolius Raf.

1. Submersed leaves 0.5 - 1.5 mm wide, very narrow, up to 5 cm long, sessile. Veins 1-3, faint.

2. Floating leaves 1 - 4 cm long, 1-3.5cm wide, oval, with rounded tips, tapering to the base. Veins 7 - 15.

3. Petioles of floating leaves 5 - 25 mm long, slender.

4. Stipules of floating leaves 2-3 cm long, partially attached to the petiole.

5. Fruits (achenes) in upper cylindrical spikes 5 - 20 mm long and in lower globose spikes. Peduncles of upper spikes 1 - 5 mm long, the lower spikes nearly sessile.

6. Individual achene 1 - 1.8 mm long, dorsal keel conspicuous and toothed. Drawing enlarged 10 times.

June - August. Shallow water of ponds and lakes.

Distribution: Mostly the southern half of the state.

VASEY'S PONDWEED

Potamogeton vaseyi Robbins

1. Submersed leaves 2-6 cm long, 0.2 - 0.5 mm wide, narrow, sessile, tapering to a sharp tip. Vein 1.

2. Floating leaves 8 - 15 mm long, half as wide, oval to elliptical, tips rounded. Plants with floating leaves are generally fruiting, plants with submersed leaves only may produce many winter buds and no achenes. Veins 5-9.

3. Petioles of floating leaves 5 - 20 mm long, slender.

Stipules 5 - 10 mm long, narrow.

4. Stem very slender, often branched.

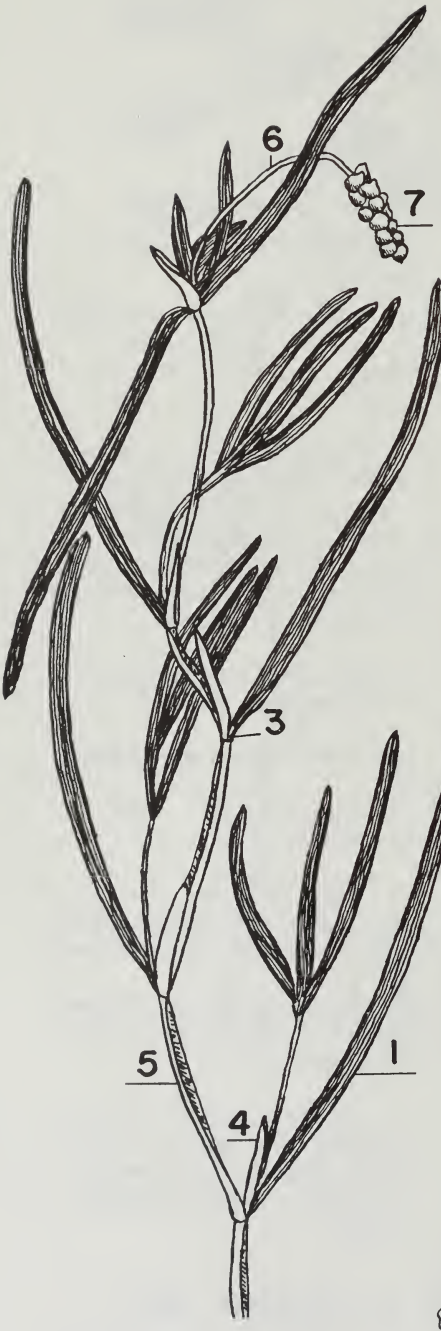
5. Peduncle slender, 10 - 15 mm long, spike often emersed, later submersed by the curving peduncle.

6. Fruits (achenes) in cylindrical spike 5 - 8 mm long, achenes in interrupted whorls.

7. Individual achene 1.5 - 2.5 mm long, very small, oval, with flattened sides, dorsal keel low and round. Drawing enlarged 5 times.

July - September. Lakes

Distribution: Northeastern part of the state.



FLATSTEM PONDWEED

Potamogeton zosteriformis Fern.

1. Submersed leaves 10 - 20 cm long, 2 - 5 mm wide, linear, somewhat narrowed at the base. Main veins 1-3, other very fine veins 9-35.

Floating leaves none.

2. Leaf apex rounded with a sharp tip. Drawing enlarged 3 times.

3. Petioles not distinct, leaves narrowed to the base.

4. Stipules 1 - 3 cm long, free from the leaf base.

5. Stem 1 - 5 mm wide, branched, flattened, slightly winged.

6. Peduncle 2 - 5 cm long, often curved.

7. Fruits (achenes) in cylindrical spike 1.5 - 2.5 cm long.

8. Individual achene 3.5 - 5 mm long, dorsal keel sharp, somewhat dentate. Drawing enlarged 3 times.

June - August. Ponds and slowly moving water.

Distribution: Northern counties of the state.

FRIES'S PONDWEED

Potamogeton friesii Rupr.

1. Submersed leaves 3 - 8 cm long, 1.5 - 3 mm wide, linear, sessile, with a cusp or tooth at the rounded tip of the blade. Veins 5-7, all faint except the midvein.

Floating leaves none.

2. Stipules 7 - 10 mm long, whitish, becoming fibrous or shredded, not attached, a small gland on each side at the base.

3. Stem somewhat flattened, with few branches except near the upper part.

4. Peduncle 1 - 1.5 cm long, flattened.

5. Fruits (achenes) in spike 7 - 18 mm long, in 3-4 groups or whorls.

6. Individual achene 2 - 3 mm long, rounded on the back, beak short. Drawing enlarged 9 times.

July - September. Lakes

Distribution: Northeastern part of the state.

LEAFY PONDWEED

Potamogeton foliosus Raf.

1. Submersed leaves 2 - 5 cm sometimes 7 - 8 cm long, 0.5 - 3 mm wide, linear, narrowed at the base, with no glands. Veins 3-5, those on either side of the main vein very fine.

Floating leaves none.

2. Petioles not distinct, the leaf blade narrowed to the base. Drawing enlarged 5 times.

Stipules 5 - 10 mm long, lower half attached to the stem, soon disappearing.

3. Stem slender, freely branched, bushy.

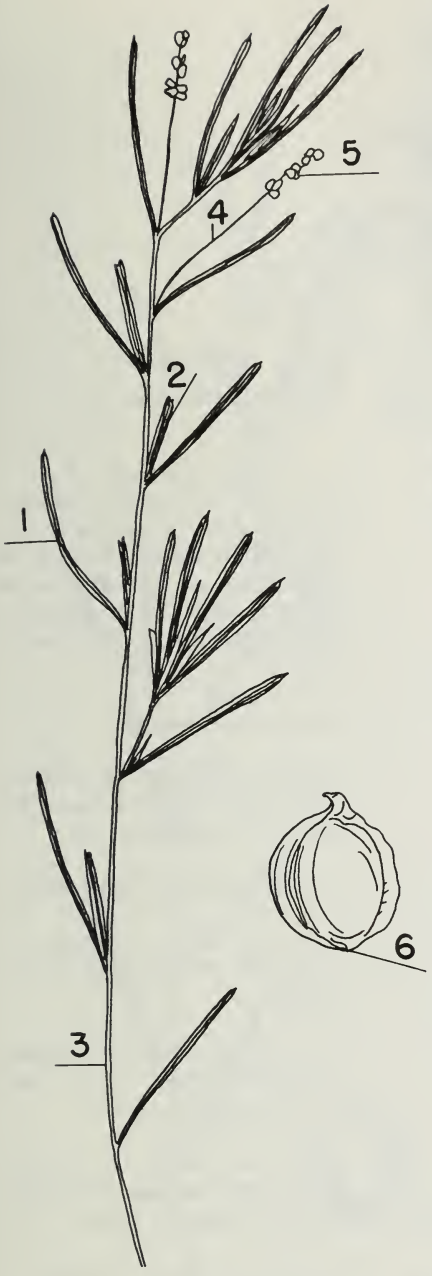
4. Peduncles 3-10 mm long, often thicker than stem. Drawing enlarged 5 times.

5. Fruits (achenes) in globose spikes 2 - 8 mm long. Drawing enlarged 5 times.

6. Individual achene 2 - 2.5 mm long, with sharp, notched dorsal keel. Drawing enlarged 7 times.

June - August. Ponds and slowly moving water.

Distribution: Common and state wide.



NARROWLEAF PONDWEED

Potamogeton strictifolius Benn.

1. Submersed leaves 2-6 cm long, 0.5 - 2 mm wide, sessile, stiff, obtuse or tapering to a bristle tip, a pair of glands at the base of the blade. Veins 3, the 2 lateral ones very fine.

Floating leaves none.

2. Stipules 5 - 15 mm long, not adnate or attached.

3. Stem very slender, long sometimes branched.

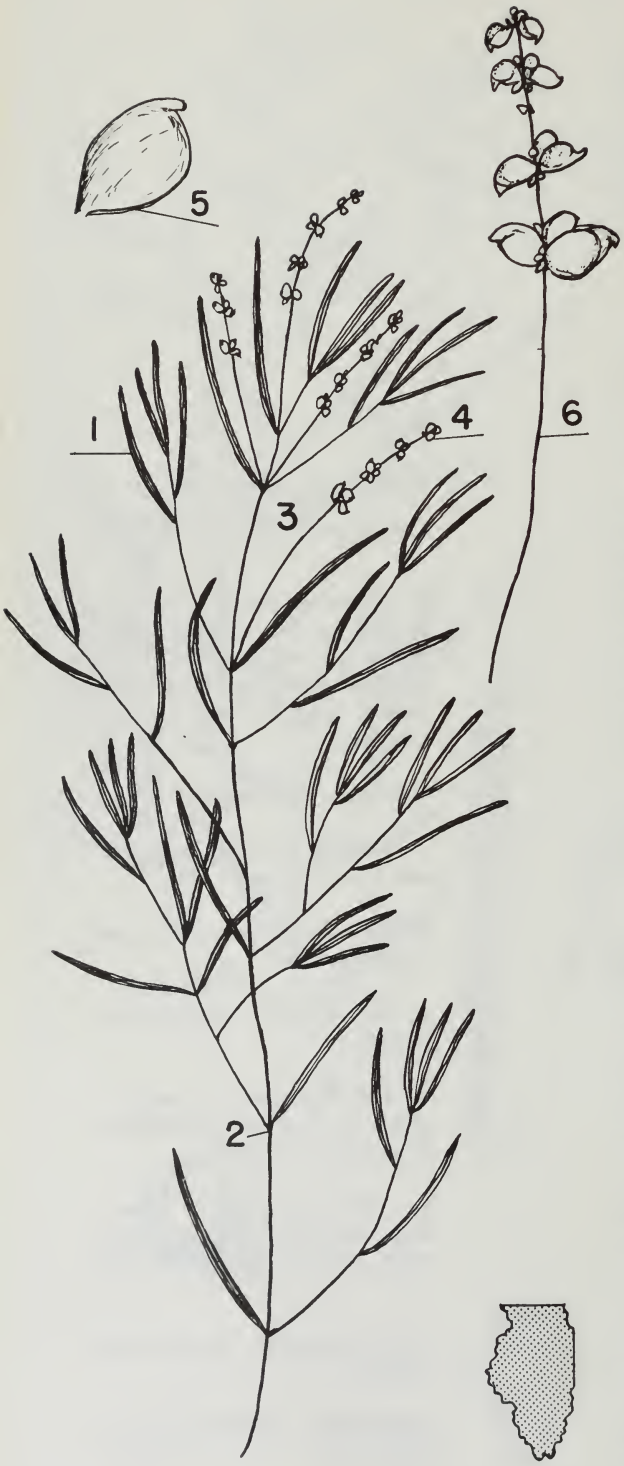
4. Peduncles 1 - 4 cm long, very slender.

5. Fruits (achenes) in slender spikes 1 - 2 cm long, achenes in 2 - 4 groups or whorls.

6. Individual achene 2 - 3 mm long, very small, the keel low or none. Drawing enlarged 9 times.

July - September. Shallow water of lakes.

Distribution: Northeastern part of the state



SMALL PONDWEED

Potamogeton pusillus L.

1. Submersed leaves 1 - 6 cm long, 0.5 - 2 mm wide, narrow, not bristle-tipped, some with a pair of basal glands. Veins 3, the midvein more conspicuous, the two lateral ones very fine. Petioles none, blade tapering from base to tip.

Floating leaves none.

Stipules 6 - 17 mm long, tubular, united from the base to above the middle, not persisting.

2. Stem slender and branching.

3. Peduncles 3 - 8 cm long, thread-like, from axils of upper leaves.

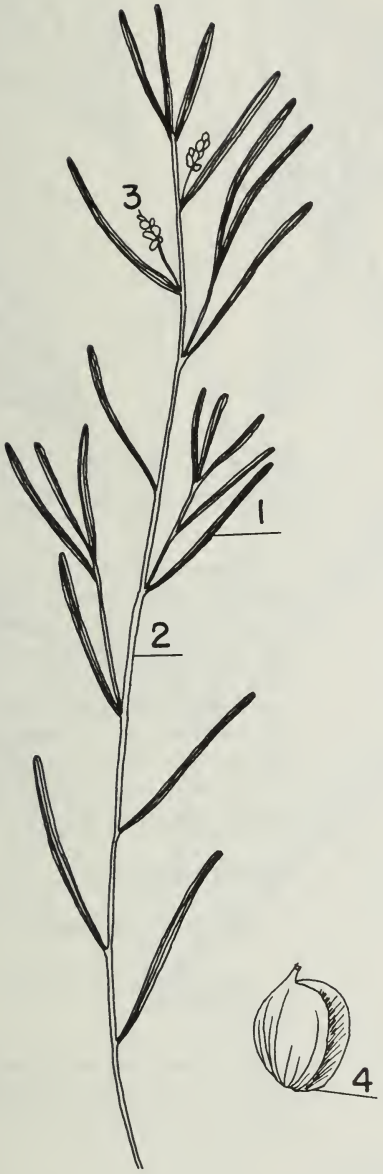
4. Fruits (achenes) in elongated, interrupted spikes 1 - 5 cm long, in 2-5 groups or whorls.

5. Individual achene 2 - 2.9 mm long, dorsal keel low, rounded. Drawing enlarged 7 times.

6. Detail of spike. Drawing enlarged 6 times.

June - August. Ponds and lakes.

Distribution: Probably state wide.



BERCHTOLD'S PONDWEED

Potamogeton berchtoldi Fieber

1. Submersed leaves 10 - 50 mm long, 0.5 - 1 mm wide, linear, with a pair of glands at the base, not bristle tipped. Veins 3, with central vein most conspicuous. Petioles none, blades taper to the base.

Floating leaves none.

Stipules 3 - 15 mm long, sometimes appearing as if rolled inward from the edges, not attached.

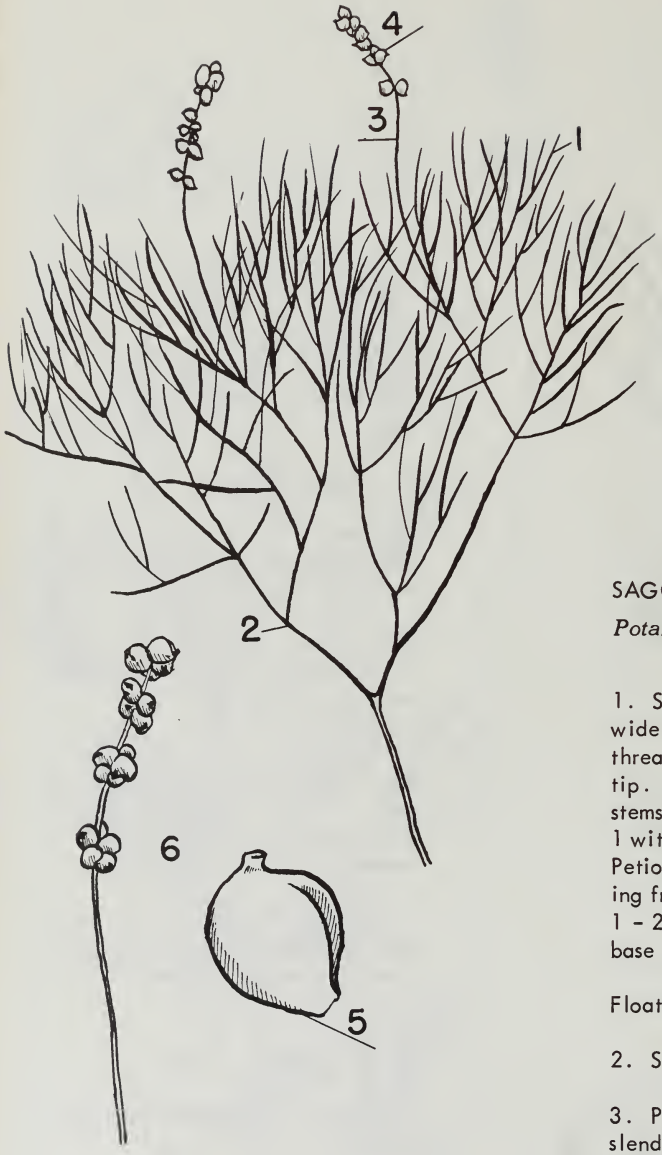
2. Stem very slender, round, with few branches or none. Winter buds sometimes at stem tips.

3. Peduncles 0.5 - 3 cm long, very slender, from upper leaf axils. Fruits (achenes) in spikes 2 - 8.5 mm long, the groups of achenes separated into whorls.

4. Individual achene 2 - 2.5 mm long, very small, beak short. Drawing enlarged 8 times.

July - September. Lakes.

Distribution: Northeastern part of the state.



SAGO PONDWEED

Potamogeton pectinatus L.

1. Submersed leaves 0.5 - 1.5 mm wide, 3 - 15 cm long, coarsely thread-like, tapering to a sharp tip. Massed leaves at the ends of stems may appear fan-like. Veins, 1 with some small cross veins. Petioles not distinct, blades tapering from base to tip. Stipules 1 - 2 cm long, attached to the leaf base for half their length.

Floating leaves none.

2. Stem branching freely.

3. Peduncle 3 - 12 cm long, slender.

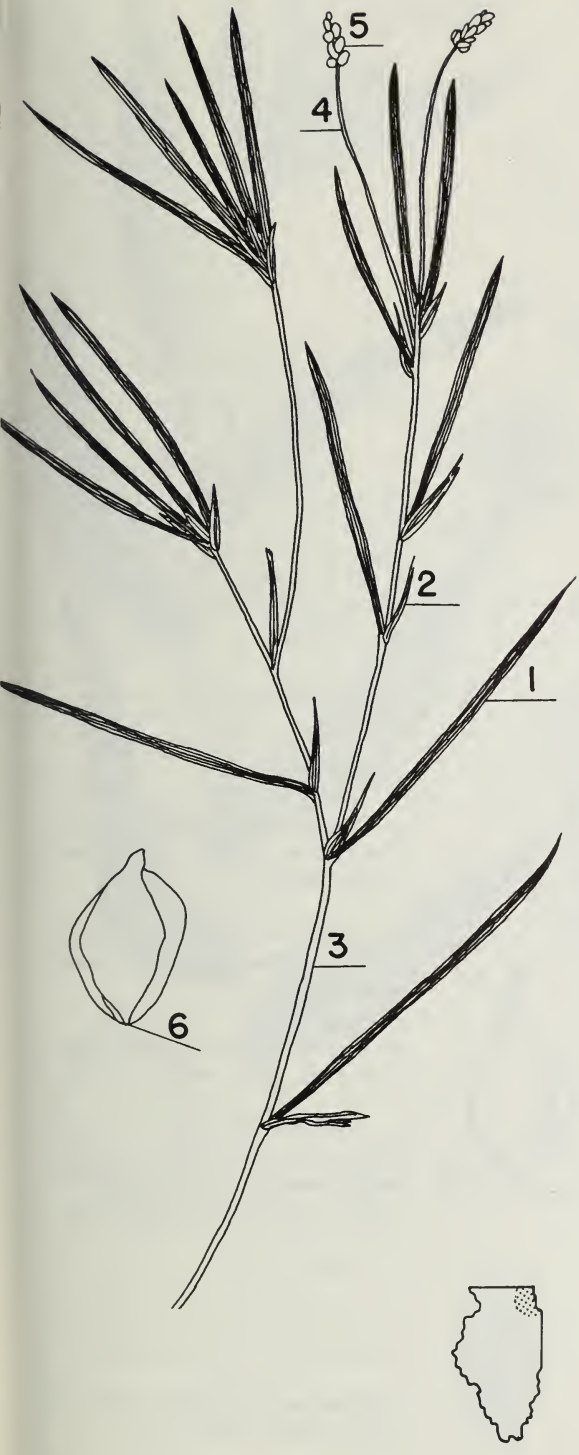
4. Fruits (achenes) in interrupted spikes 1 - 4 cm long with several groups or whorls of achenes.

5. Individual achene 3.5 - 4.5 mm long, rounded keels, beak short. Drawing enlarged 7 times.

6. Detail of a spike. Drawing enlarged 2 times.

June - August. Shallow to deep water of ponds and lakes.

Distribution: Probably state wide.



FLATLEAF PONDWEED

Potamogeton robbinsii Oakes

1. Submersed leaves 3 - 10.5 cm long, 3 - 5 mm wide, narrowly linear, contracted at the base, stiff and straight, margin minutely serrate. Veins 20-60, very fine. Petioles none, blades abruptly contracted at the base.

Floating leaves none.

2. Stipules 20 - 30 mm long, attached to leaf for 5 - 15 mm, soon decaying or reduced to fibers.

3. Stem often unbranched, except in flowering plants.

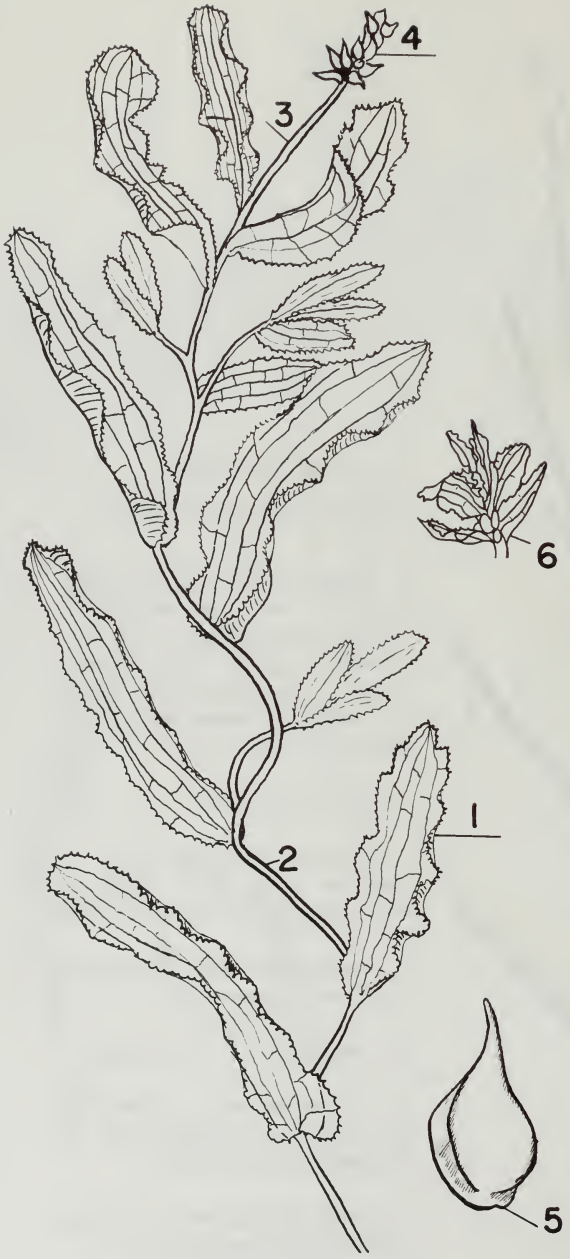
4. Peduncles 2 - 2.5 cm long.

5. Fruits (achenes) in spikes 7-15 mm long, often whorled, the achenes seldom maturing.

6. Individual achene 4 mm long, with a sharp dorsal keel and 2 rounded ones. Drawing enlarged 5 times.

July - September. Lakes

Distribution: Northeastern part of the state.



CURLYLEAF PONDWEED

Potamogeton crispus L.

1. Submersed leaves 3 - 12 cm long, 6 - 15 mm wide, rounded at the tips, wavy margined and crisped. Veins 3-7, the midrib often red-brown. Petioles none, the rounded leaf base sessile but not clasping.

Floating leaves none.

Stipules 4 - 5 mm long, soon disappearing.

2. Stem somewhat flattened with few to many branches, brittle and easily broken.

3. Peduncle 2 - 7 cm long, about as thick as the stem, often curved when in fruit.

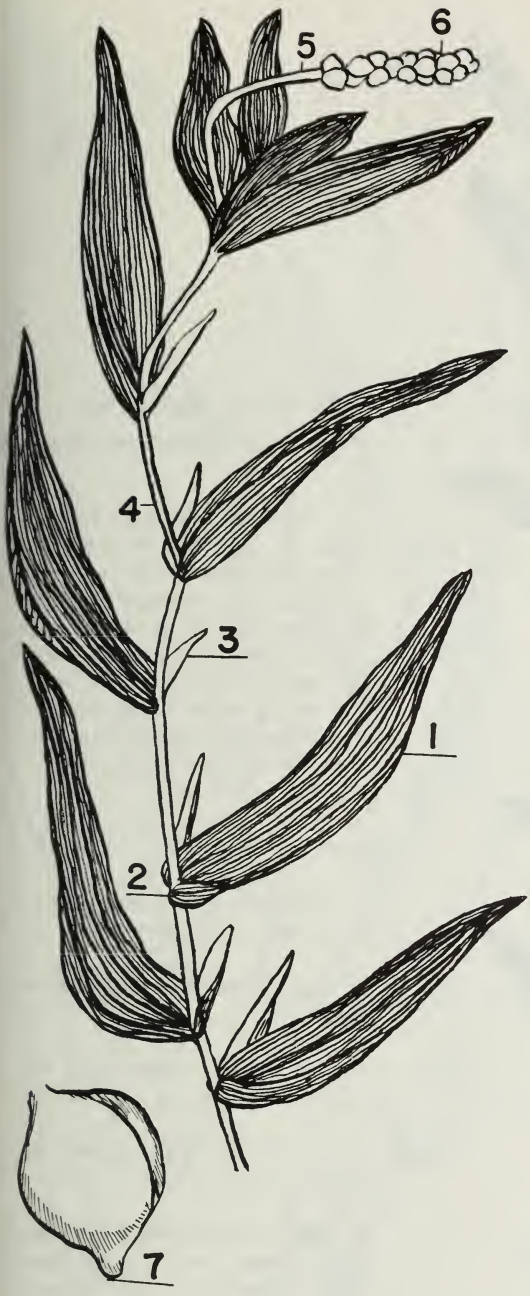
4. Fruits (achenes) in spike about 1 cm long, often densely fruited.

5. Individual achene 2.5 - 3 mm long, turgid or swollen, with rather conspicuous beaks 2 - 3 mm long. Drawing enlarged 5 times.

6. Winter bud.

May - July. Ponds and lakes.

Distribution: Generally in the northern half of the state.



WHITESTEM PONDWEED

Potamogeton praelongus Wulfen

1. Submersed leaves 10 - 40 cm long, 10 - 30 mm wide, lanceolate, widest at the base, leaf tips rounded or boat-shaped and splitting when pressed. Veins 13-25, with from 3-5 of these conspicuous.

Floating leaves none.

2. Petioles none. Leaves cordate or rounded at the base and clasping half way around the stem.

3. Stipules 1 - 10 cm long, white, resembling tissue paper, often apressed to the stem, persisting.

4. Stem green in young plants, turning whitish, often branched with a zig-zag appearance.

5. Peduncle 12 - 40 cm long, about as thick as the stem.

6. Fruits (achenes) in a cylindrical spike 3 - 6 cm long, often with only a few achenes maturing.

7. Individual achene 4 - 5.5 mm long, the dorsal keel sharp, beak short. Drawing enlarged 7 times.

June - August. Usually deep water.

Distribution: Northern counties of the state.

RICHARDSON PONDWEED

Potamogeton richardsonii (Benn.) Ry

1. Submersed leaves 2 - 9 cm long, 10 - 25 mm wide at the base, lanceolate, leaf tips not rounded and boat-shaped but flat and tapering. Lower leaves often ovate, widest at the base, the tips pointed. Veins 15-30, with 3-7 more prominent than others. Leaves sessile, clasping the stem, from half to three-fourths the diameter of the stem.

Floating leaves none.

2. Stipules 1 - 2 cm long, whitish, blunt, soon disappearing.

3. Upper stem often branched and leafy.

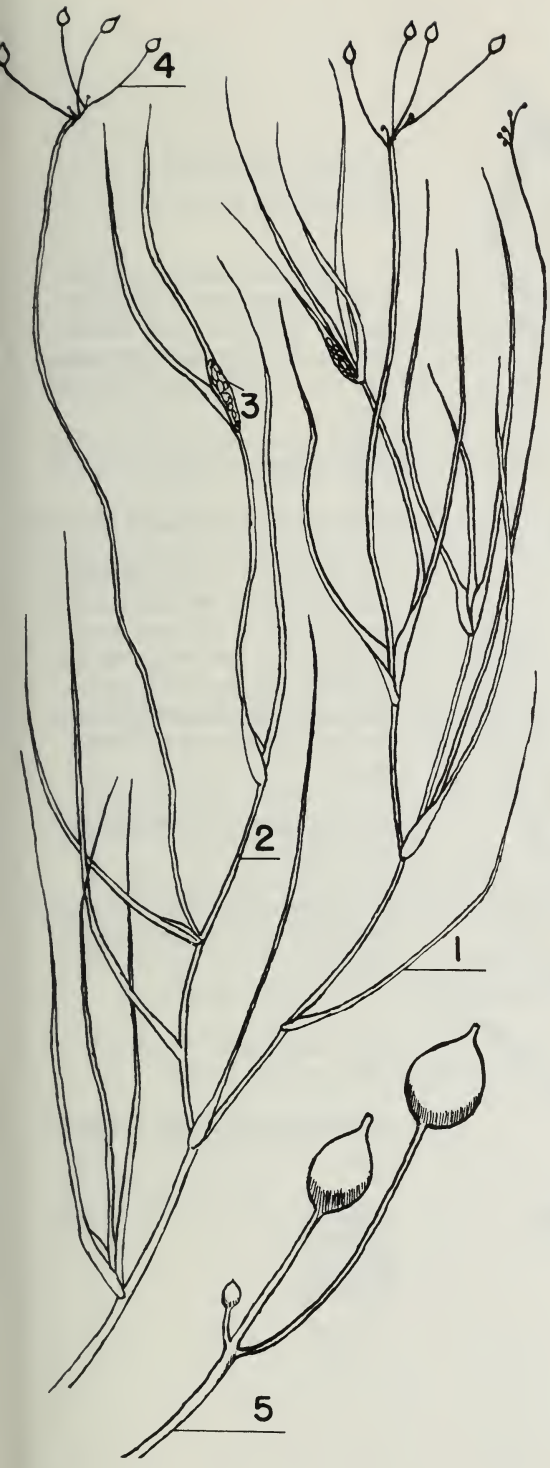
4. Peduncle 2 - 10 cm long, as thick as the stem.

5. Fruits (achenes) in cylindrical spike 1.5 - 3 cm long.

6. Individual achene 2.7 - 4 mm long, plump, keels rounded, beak short. Drawing enlarged 7 times.

June - August. Ponds and slowly moving water.

Distribution: Northern part of the state.



WIDGEON GRASS

Ruppia maritima L.

1. Submersed leaves 4 - 10 cm long, 0.5 mm wide, very slender, alternate, sessile, tapering to the tip. Stipules 10 - 30 mm long, sheathing, attached to the basal part of the leaves. Floating leaves none.

2. Stem slender, delicate, branched or with no branches.

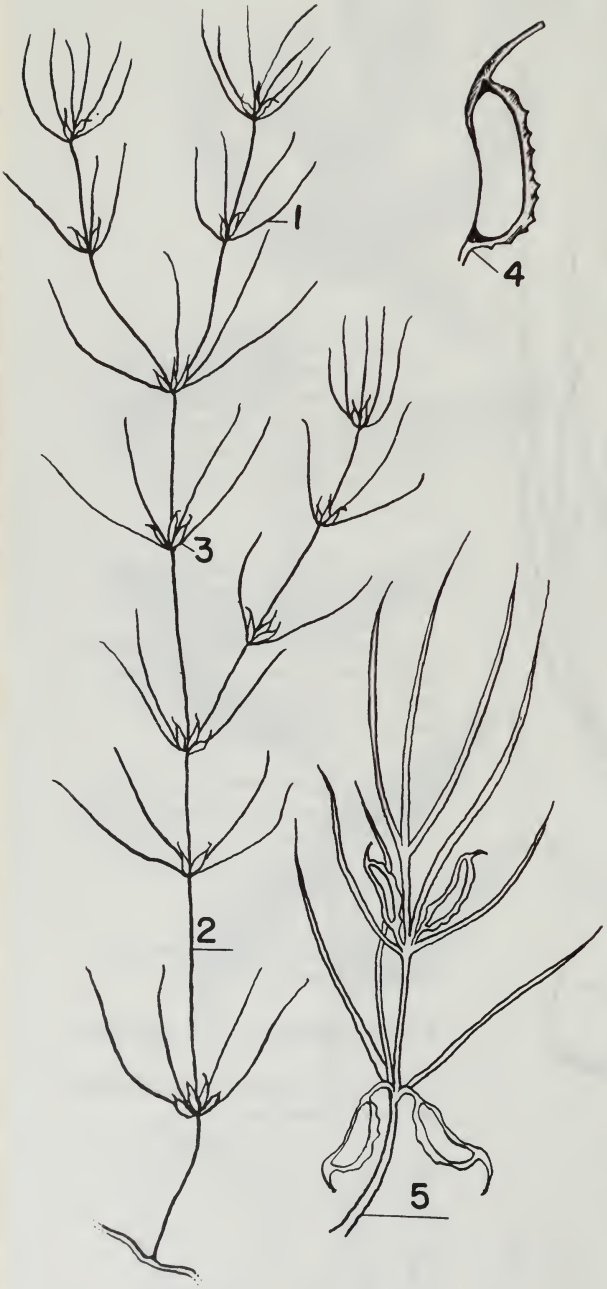
3. Flowers completely concealed in the thin, sheathing leaf bases until after flowering when the peduncle elongates.

4. Fruits in an umbel-like cluster with each fruit on a separate pedicel. The entire fruiting cluster on a long, thread-like peduncle coiled or straight.

5. A fruiting cluster. Drawing enlarged 8 times.

August - October. Ponds and lakes.

Distribution: Known from Vermilion and Lake Counties.



HORNED PONDWEED

Zannichellia palustris L.

1. Submersed leaves 4 - 15 cm long, 0.5 mm wide, opposite or several in a whorl, very slender, sessile, somewhat tapered to the leaf tip. Stipules sheath the leaf bases.

Floating leaves none.

2. Stem slender, fragile, branched.

3. Flowers very small, staminate and pistillate in the same axillary group. Fruit 2 - 3.5 mm long, curved, often dentate on the convex side, sessile or with short stalk, sometimes several fruits in one whorl, beaks up to 1.5 mm long.

4. A single fruit. Drawing enlarged 9 times.

5. A portion of a stem with leaves and fruits. Drawing enlarged 5 times.

July - September. Ponds and slowly moving streams.

Distribution: Northern half of the state.

PONTEDERIACEAE (PICKEREL WEED FAMILY)

Key to Genera

Leaves large, often 18 cm long, heart-shaped to lanceolate. Flowers numerous, generally blue, in a tight, spike-like panicle. *Pontederia*. Page 102.

Leaves long and grass-like, flattened, kidney-shaped or oval. Flowers generally 1 to 8 from a leaf-like spathe, pale yellow, white or blue. *Heteranthera*. Key below.

Key to Species of *Heteranthera*

1. Leaves much longer than wide, grass-like with no prominent mid-vein. Flowers pale yellow, generally solitary. *Heteranthera dubia*. Page 103.

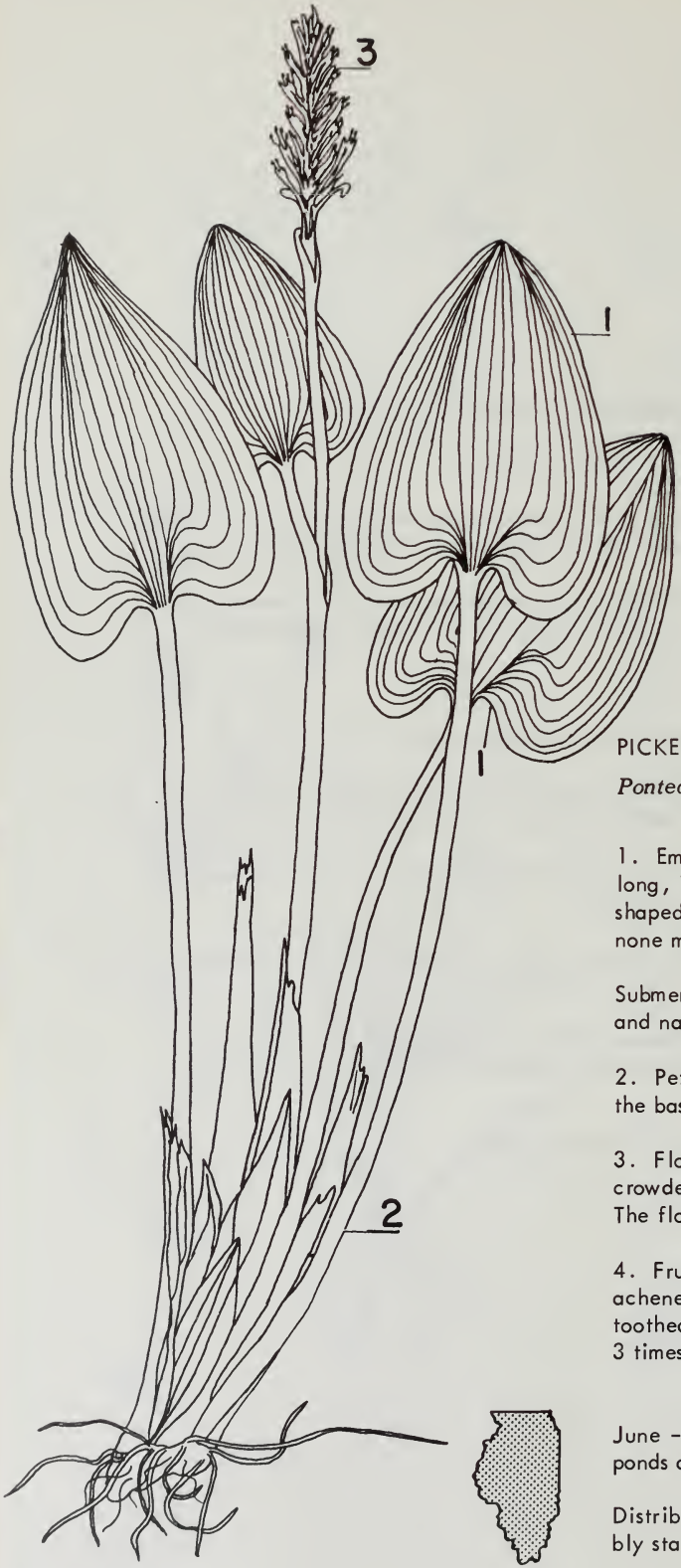
1. Leaves kidney-shaped or oval, veins more prominent. Flowers solitary or more than one, white or pale blue.

    2. Leaves kidney-shaped to nearly round. Flowers 2-8, generally blue. *Heteranthera reniformis*. Not illustrated.

    2. Leaves oval to broadly oval. Flowers solitary, white to pale blue. *Heteranthera limosa*. Not illustrated.

REFERENCES

Gleason: Vol. 1, 384-385.
Fassett: 171-173.
Muenscher: 199-204.
Jones: 290.



PICKEREL WEED

Pontederia cordata L.

1. Emersed leaves up to 180 cm long, base of the blade heart-shaped. Veins very fine, numerous, none more conspicuous than others.

Submersed leaves, if present, long and narrow.

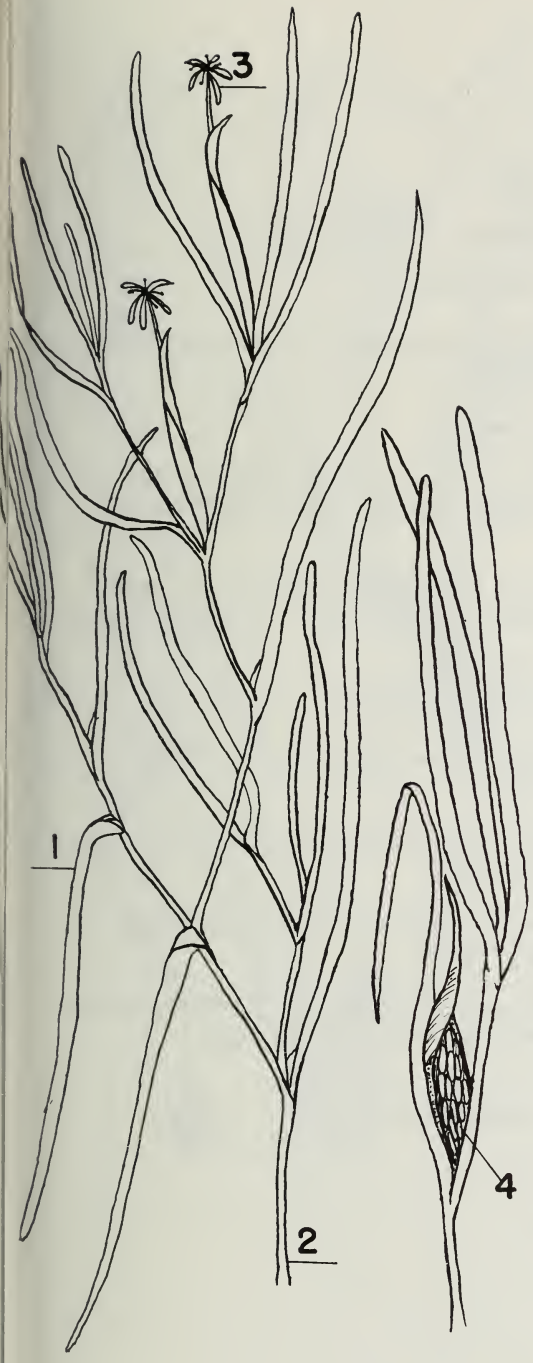
2. Petioles spongy, arising from the base of the plant.

3. Flowers small, blue to white, crowded in a spike-like panicle. The flowering stalk bears 1 leaf.

4. Fruits, bearing 1 seed, are achene-like, 6 - 10 mm long, with toothed ridges. Drawing enlarged 3 times.

June - September. Margins of ponds and streams.

Distribution: Scattered and probably state wide.



WATER STARGRASS

Heteranthera dubia (Jacq.) MacM.

1. Submersed leaves 10 - 15 cm long, 2.5 - 6 mm wide, sessile, grass-like. Plants often stranded on mud banks or in very shallow water may produce many flowers.

Floating leaves may be present in deep water.

2. Stems submersed, long, slender, with many branches.

3. Flowers small, pale yellow, in leaf axils, partially enclosed by a leaf-like spathe 2.5 - 5 cm long. Plants seldom flower in deep water.

4. Fruit an oval capsule up to 1 cm long, often entirely concealed among leaves and in the spathe. Drawing enlarged 3 times.

July - September. Shallow to deep water and muddy shores.

Distribution: Northern half of the state.

HYDROCHARITACEAE (FROGBIT FAMILY)

Key to Genera

1. Leaves cordate (heart-shaped) with long petioles, floating or sometimes emersed. *Limnobium*. Page 105 .

1. Leaves neither cordate nor long petioled.

    2. Leaves all basal, narrow, much longer than wide, with many fine, parallel veins, upper ends of leaves sometimes floating. *Vallisneria* . Page 106 .

    2. Leaves not basal, in whorls of 3-6, with one principal vein. Plants entirely submersed or breaking free and floating. *Elodea*. Key below.

Key to Species of *Elodea*

1. Leaves three in a whorl. Plants submersed and rooted on the bottom or floating free in masses.

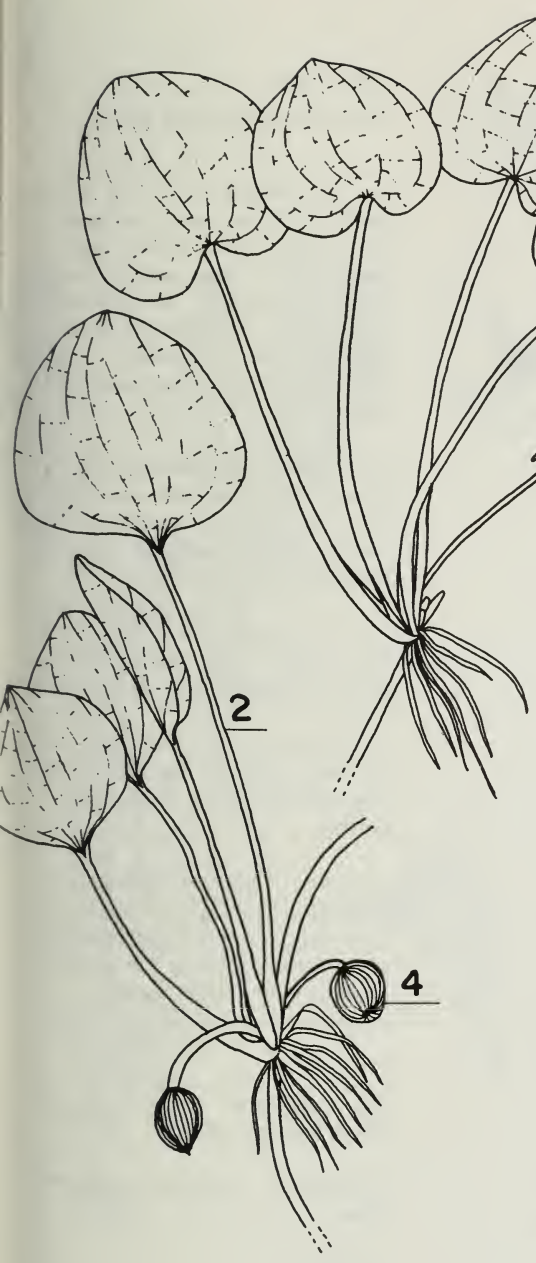
    2. Leaves about 2 mm wide, 1 - 2 cm long, thin, the tips rounded. *Elodea canadensis*. Page 107 .

    2. Leaves about 1.5 mm wide, 1 - 2 cm long, thin, the tips pointed. *Elodea nuttallii*. Not illustrated.

1. Leaves six in a whorl, 3 - 5 mm wide, 2 - 3 cm long. Plants submersed or sometimes floating. *Elodea densa*. Not illustrated.

REFERENCES

Gleason: Vol. 1, 94-96.
Fassett: 97-99.
Muenscher: 102-104, 106-110.
Jones: 293.



FROGBIT

Limnobium spongia (Bosc) Steud.

1. Floating leaves, or sometimes emersed leaves, 2 - 7.5 cm long, round, oval or cordate. Young leaves spongy and purplish underneath, often clustered at nodes of stolons or runners.

Submersed leaves none.

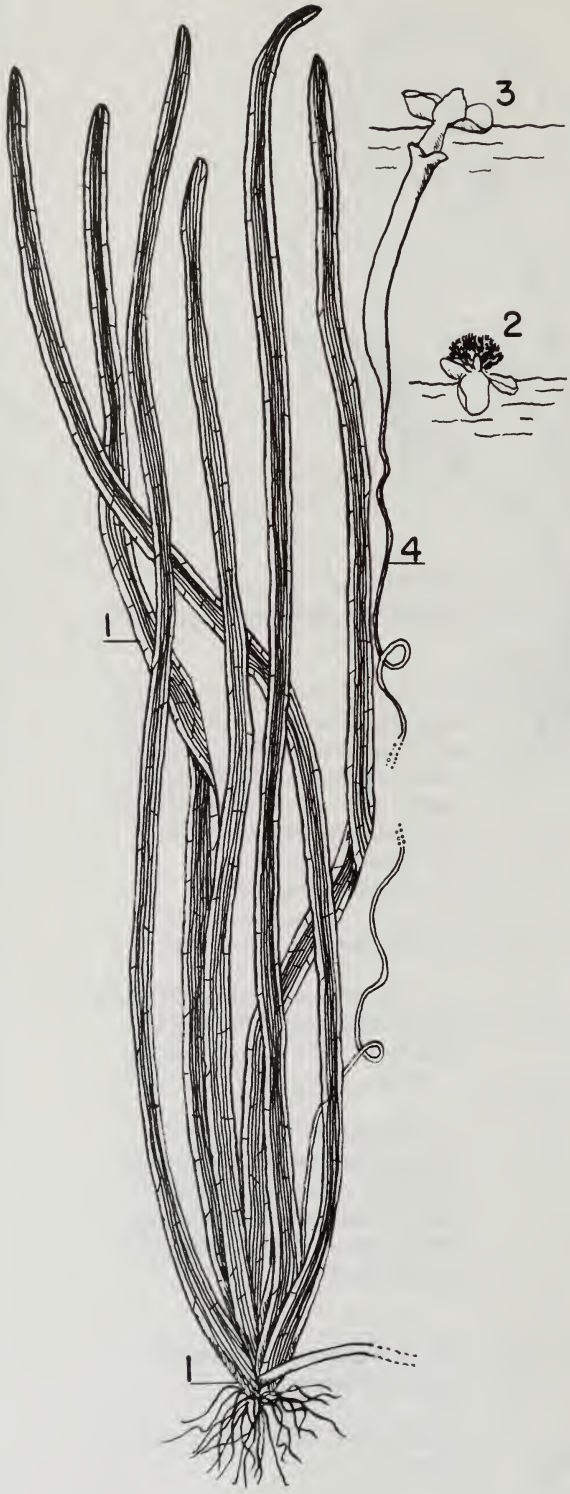
2. Petioles long and slender.

3. Staminate and pistillate flowers on separate plants. Staminate flowers 2 - 2.5 cm wide, white or cream, peduncles 7.5 cm long.

4. Pistillate flowers slightly smaller than the staminate, white or cream, peduncles 2 - 3 cm long. Fruits on pistillate plants, oval to round, fleshy, peduncles recurved in fruit.

June - September. Ponds and slowly moving streams.

Distribution: Southern part of the state.



EEL GRASS

Vallisneria americana Michx.

1. Submersed leaves 20 cm to 2 m long, 5 - 20 mm wide, all basal, thin, ribbon-like, sessile, leaf tips rounded, upper parts of leaves sometimes floating. Veins numerous, fine, with a midvein more prominent than the others. Completely floating and emersed leaves none.

2. Flowers on separate plants (dioecious). Staminate flowers 3 - 4 mm across, breaking loose from the plant, floating. Drawing enlarged 10 times.

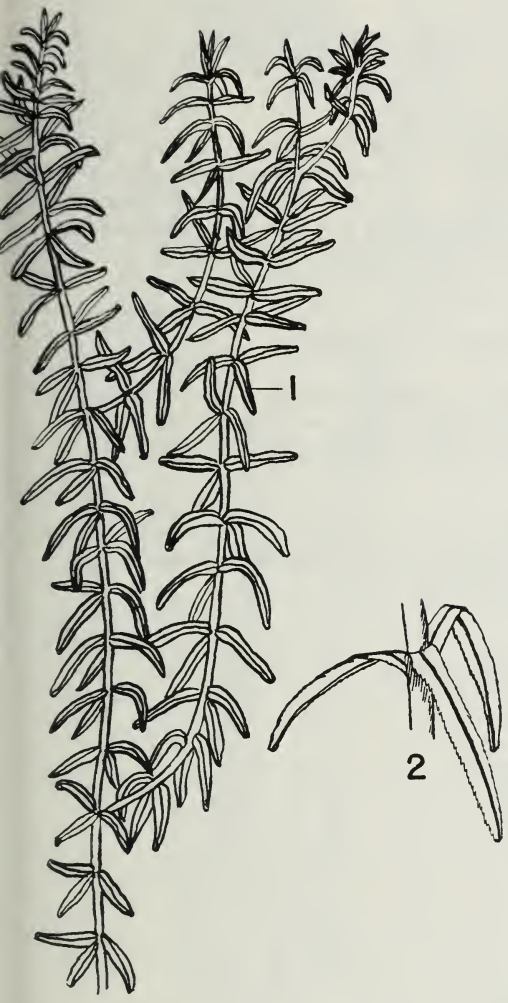
3. Pistillate flowers 2 - 3 cm long, solitary, white, in a tubular sheath. Drawing enlarged 5 times.

4. Peduncle of the pistillate flower slender, very long and often coiled, the flower maturing on the water surface.

Fruit 6 - 12 cm long, cylindrical. As the fruit matures the peduncle coils and pulls the entire structure under water. Mature plants often produce buds from creeping rhizomes or runners.

July - September. Lakes and slowly moving water.

Distribution: Northern part of the state.



AMERICAN ELODEA

Elodea canadensis Michx.

1. Submersed leaves 1 - 2 cm long, 1.5 - 4 mm wide, thin, tips rounded, in groups of 3, often crowded at branch tips.

Floating and emersed leaves none.

Stem brittle, often branched sometimes breaking and floating.

Flowers are on separate plants (dioecious). Staminate 6 - 10 mm wide, pistillate 5 - 5.5 mm wide. Plants seldom flower except in aquaria.

Fruit a capsule, 5 - 6 mm long, sessile, in leaf axil.

2. Portion of stem with leaves. Drawing enlarged 5 times.

July - August. Slowly moving water and lakes.

Distribution: Widely distributed in the state.

ARACEAE (ARUM FAMILY)

This family is represented by four genera in Illinois: Arrow arum (*Peltandra*) and sweetflag (*Acorus*) are illustrated and described in this manual. Jack-in-the-pulpit and skunk cabbage represent the other two genera respectively.

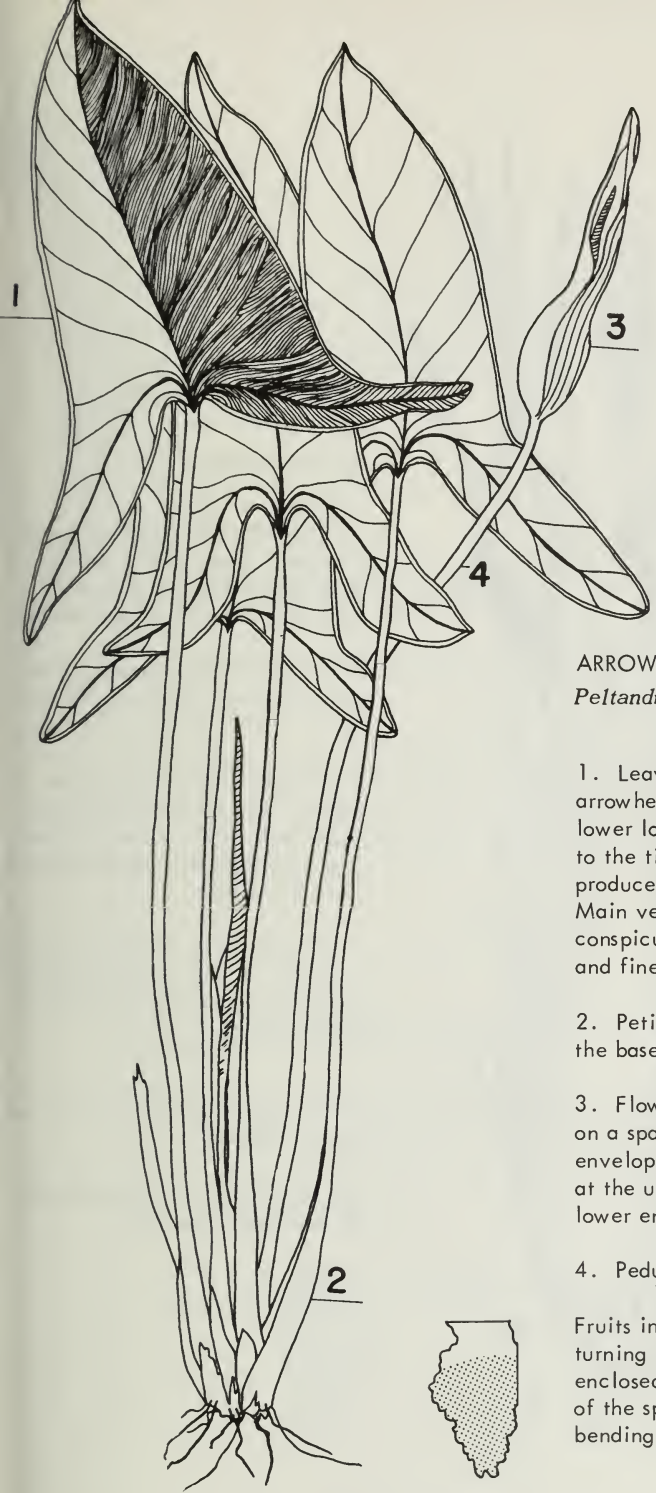
Key to Genera in this manual

Leaves all basal, arrowhead shaped, lower lobes of blades extending down. Midvein and those of the lobes more prominent than the others. Flowers in a club-shaped spadix surrounded with a green, tapering spathe (envelope).
Peltandra. Page 109.

Leaves all basal, grass-like, blades narrow and much longer than wide. Midvein off center of the blade. Flowers spike-like from the side of the stalk (scape), and with no green spathe. *Acorus*. Page 110.

REFERENCES

Gleason: Vol. 1, 368-370.
Fassett: 164-166.
Muenscher: 175-176, 178 and 180.
Jones: 299.



ARROW ARUM

Peltandra virginica (L.) Kunth

1. Leaves 10 - 35 cm long, basal, arrowhead shaped or triangular, lower lobes spreading and tapering to the tips. Larger leaves often produced after plants flower. Main vein and those of the lobes conspicuous, other veins numerous and fine.

2. Petioles long, overlapping at the base.

3. Flowers very small, crowded on a spadix enclosed by a green envelope-like spathe, staminate at the upper and pistillate at the lower end of the spadix.

4. Peduncle thickened and sturdy.

Fruits in a globular head of berries turning brown at maturity and enclosed with the lower remnants of the spathe, the peduncle often bending to submerse the fruits.

Distribution: Southern two-thirds of the state.

May - June. Ditches, margins of ponds and in shallow water.

SWEETFLAG

Acorus calamus L.

1. Leaves 9 - 25 mm wide, up to 1 m long, linear, stiff, overlapping, basal, from an aromatic rhizome. Plants forming colonies.

2. Veins parallel, numerous, the midvein usually off-center of the leaf.

3. Flowers very small, yellow-brown, crowded and numerous on a spadix 4 - 8.5 cm long. Spike-like spadix borne on a scape which resembles a leaf.

4. Root-bearing rhizome buried in mud. Entire basal part of the plant and rhizome is aromatic and has a sweet taste.

June - August. Ponds, wet ground along streams.

Distribution: Scattered localities but probably state wide.

LEMNACEAE (DUCKWEED FAMILY)

These plants are very small and not differentiated into stems and leaves. Duckweeds are the smallest known flowering plants and some species have not been observed in flower. A hand lens is essential in studying most of them.

Key to Genera

1. Plants with no roots.

    2. Plants thick and fleshy in appearance, oval to globular in shape. *Wolffia*. Key below.

    2. Plants thin, flat, strap-like. *Wolffiella*. Page 113. No. 1

1. Plants with roots.

    3. Plants each with one root. *Lemna*. Page 112.

    3. Plants each with 2-9 roots. *Spirodela*. Page 112.

Keys to Species

Wolffia

1. Plants flat or flattened on the upper surface, with brown dots (punctate), bearing one nipple-like papilla.

    2. Upper side nearly flat and gradually elevated at one end to a nipple-like papilla. *Wolffia punctata*. Page 113. No. 2.

    2. Upper side with a nipple-like papilla near the center. *Wolffia papulifera*. Page 114. No. 3.

1. Plants rounded on the upper side with no brown dots, often bearing 1-3 nipple-like papillae. *Wolffia columbiana*. Page 114. No. 4.

Lemna

1. Plants oar-shaped, the segments often extended into narrow, stalk-like stipes and remaining attached to parent plants thus forming tangled masses.
   Lemna trisulca. Page 115. No. 5.

1. Plants oval and generally separating, not forming tangled masses.

   2. Segments narrow and curved (falcate).

      3. Segments with 3 nerves or lines. *Lemna perpusilla*. Page 115. No. 6.

      3. Segments with 1 nerve or line. *Lemna valdiviana*. Page 116. No. 7.

   2. Segments oval or circular and rounded on both surfaces. *Lemna minor*. Page 116. No. 8.

Spirodela

1. Plants about 6 mm long, broadly oval, with 6 nerves or lines on the upper surface, reddish-purple beneath, 4-18 roots. *Spirodela polyrhiza*. Page 117. No. 9.

1. Plants not more than 4 mm long, oblong, with 5 nerves or lines, not reddish-purple beneath, 2-6 roots. *Spirodela oligorhiza*. Not illustrated.

REFERENCES

Gleason: Vol. 1, 370-372.
Fassett: 167-168.
Muenscher: 183-189.
Jones: 299-300.
Daubs, E. H. 1965. A monograph of Lemnaceae. Illinois Biological Monographs 34. University of Illinois Press. 118 pp.

1

FLORIDA WOLFFIELLA

Wolffiella floridana (Smith) Thompson

1. Individual plant 5 - 9 mm long, 0.4 - 0.7 mm wide, flat, thin, rounded at base, tapering to a slender tip. Plants have a double curve (falcate) with several often remaining attached and floating as a tangled mass. Drawing enlarged 2 times.

Stems, leaves and roots none.

Flowers seldom observed. Plants multiply by budding.

Summer months. Stagnant water.

Distribution: Southern part of the state.

2

DOTTED WATERMEAL

Wolffia punctata Griseb.

2. Segments 0.7 - 1.2 mm long, 0.4 - 0.7 mm wide, oval, flat, gradually elevated at one end into a nipple-like papilla. Plants green with brown pigment cells. Drawing enlarged 8 times.

Stems, leaves and roots none.

Flowers seldom present. Plants multiply by budding.

Summer months. Stagnant water.

Distribution: Scattered localities, probably state wide.

3

PAPILLARY WATERMEAL

Wolffia papulifera Thompson

3. Segments 0.6 – 1.5 mm long, 0.3 - 1.0 mm wide, oval, upper surface flat along margins but rising in center to nipple-like papilla. Plants green with brown pigment cells. Drawing enlarged 8 times.

Stems, leaves and roots none.

Flowers seldom present. Plants multiply mostly by budding.

Summer months. Stagnant water.

Distribution: Southern part of the state.

4

COLUMBIA WATERMEAL

Wolffia columbiana Karst.

4. Segments 0.8 - 1.4 mm long, 0.4 - 0.8 mm wide, globular, grain or meal-like, upper surface strongly rounded, light green with no dots or markings. Plants often very abundant. Drawing enlarged 8 times.

Stems, leaves and roots none.

Flowers seldom present. Plants multiply mostly by budding.

Summer months. Stagnant water.

Distribution: Probably state wide.

5

STAR DUCKWEED
Lemna trisulca L.

5. Segments 5 - 20mm long, 2.5 - 5 mm wide, submersed, oval or oblong, each with a stalk-like portion with which they remain attached forming tangled, connected masses. Drawing enlarged 3 times.

Stems and leaves none.

Root one per segment, or sometimes none.

Flowers seldom observed. Plants reproduce by budding.

Summer months. Ponds and ditches.

Distribution: Scattered localities, probably state wide.

6

VERY TINY DUCKWEED
Lemna perpusilla Torr.

6. Segments 1 - 2.5 mm long, 0.7 - 2 mm wide, oval to round, often not symmetrical, generally floating free or in groups. Drawing enlarged 3 times.

Stems and leaves none.

Root one per segment; the root tip pointed.

Flowers seldom present. Plants reproduce by budding.

Summer months. Ponds and stagnant water.

Distribution: Scattered localities, probably state wide.

VALDIVIA DUCKWEED

Lemna valdiviana Phil.

7

7. Segments 2.5 - 5 mm long, 0.5 - 1.5 mm wide, floating, oval to round, generally floating free or in tangled masses. Drawing enlarged 3 times.

Stems and leaves none.

Root one per segment.

Flowers seldom present. Plants reproduce by budding.

Summer months. Ponds and stagnant water.

Distribution: Southern half of the state.

SMALLER DUCKWEED

Lemna minor L.

8

8. Segments 3 - 6 mm long, 1.5 - 4 mm wide, oval to round, generally symmetrical, floating free or in groups. Drawing enlarged 2 times.

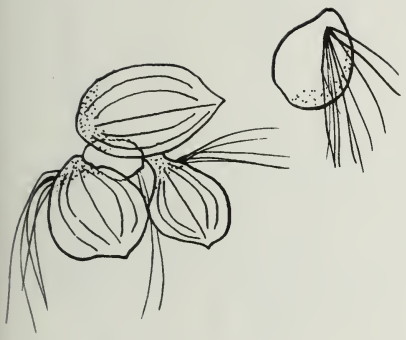
Stems and leaves none.

Root one per segment; the root tip rounded.

Flowers seldom present. Plants reproduce by budding.

Summer months. Stagnant water, ponds, slowly moving streams.

Distribution: State wide.



9

GIANT DUCKWEED

Spirodela polyrhiza (L.) Schleiden

9. Individual plants 3 - 10 mm long, 2.5 - 8 mm wide, usually oval, often not symmetrical, about 7 nerves or lines on upper surface radiating from a nodal point near the base, green above, purplish-red beneath. Drawing enlarged 2 times.

Stems and leaves none.

Roots 5 - 10, arising from a nodal point on the underside.

Flowers seldom observed. Plants multiply by budding and often remain attached to form small colonies.

Summer months. Ponds, slow streams, ditches, stagnant water.

Distribution: State wide.

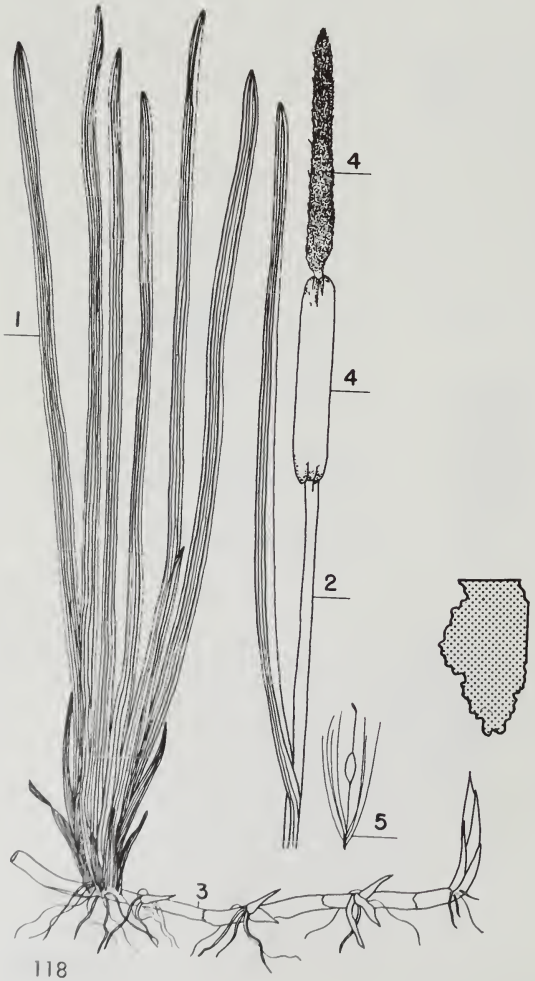
Individual flowers are very small, numerous and crowded into dense spikes. The staminate or pollen bearing flowers are at the top of the spike and the pistillate or seed producing are below. Remains of withered staminate spikes may remain attached as the seed bearing lower part matures and turns brown.

Key to Species

Leaves 1 - 2.5 cm wide, flat. Pistillate and staminate parts of the spike nearly continuous. *Typha latifolia*. Page 118.

Leaves 4 - 8 mm wide, rounded on the back: Pistillate and staminate parts of the spike generally separated by a stem-like interval. *Typha angustifolia*. Page 119.

REFERENCES Gleason: Vol. 1, 69-70. Muenscher: 15-17. Fassett: 48-49. Jones: 300.



COMMON CATTAIL
Typha latifolia L.

1. Leaves 1 - 2.5 cm wide, flat, much longer than wide, sheathing at the base.

2. Stem 1 - 3 m tall, stiff, bearing flowering spikes and leaves.

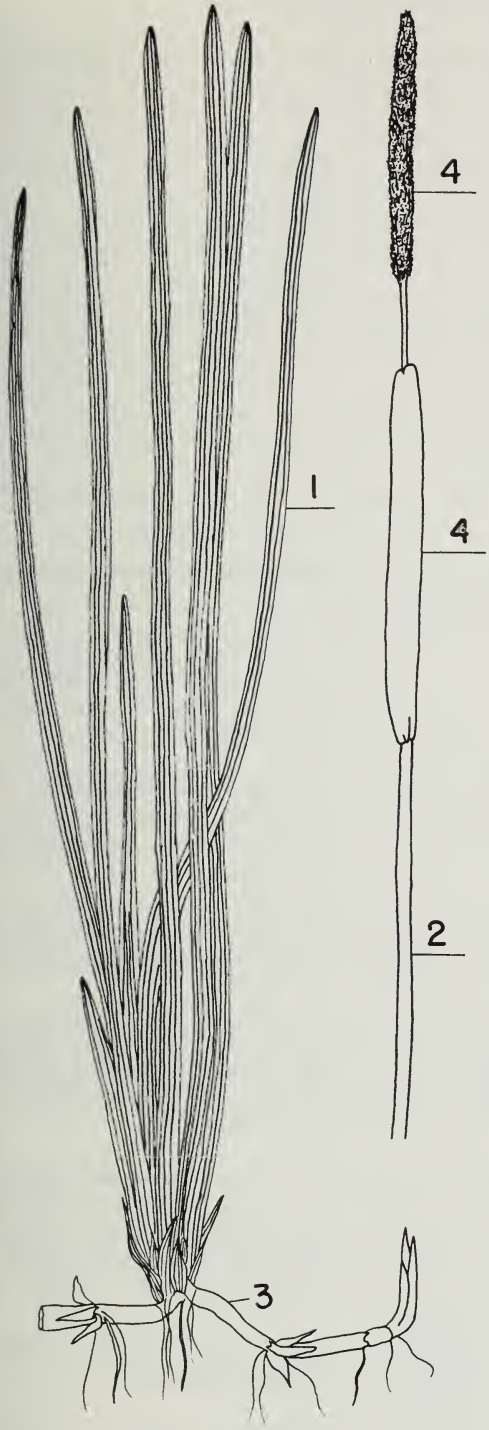
3. Rhizomes thick, creeping, plants often forming dense masses of growth.

4. Flowers very small, crowded into long, dense spikes, staminate in the upper, pistillate in the lower part. The two parts of the spike nearly continuous, greenish when young, the maturing lower part eventually turning brown.

5. Entire single fruit about 1 cm long, with many white hairs from the base, the achene near the middle. Drawing enlarged 3 times.

June - August. Ponds, ditches, lakes, rivers and wet ground.

Distribution: State wide.



NARROWLEAF CATTAIL

Typha angustifolia L.

1. Leaves 4 - 8 mm wide, much longer than wide, less flattened than in *T. latifolia.*

2. Stems 1 - 1.5 m tall, stiff.

3. Rhizomes similar to those of *T. latifolia.*

4. Flowers very small, crowded into long, dense spikes, staminate in the upper, pistillate in the lower part. The two groups generally separated about 2 - 8 cm, the maturing lower part eventually turning dark brown.

5. Entire single fruit 5 - 8 mm long, bearing an achene, and with many white hairs from the base. Drawing enlarged 4 times.

June - August. Ponds, ditches and wet ground.

Distribution: Scattered localities, probably state wide.

There are four species of bur-reed recorded for Illinois. We have illustrated and described one of them.

REFERENCES

Gleason: Vol. 1, 70-74.
Fassett: 50-53.
Muenscher: 18-26.
Jones: 300-301.

GIANT BUR-REED
Sparganium eurycarpum Engelm.

1. Emersed leaves 6 - 12 mm wide, up to 80 cm long, alternate, narrow, about the same dimensions but stiffer than floating leaves.

Floating leaves, when present, 5-15 mm wide, up to 75 - 80 cm long, flat, limp, arising from the plant base.

2. Stem 55 - 140 cm long, emersed, bearing alternate leaves and flowering heads.

3. Flowers very small, in separate globular heads, the lower pistillate, the upper staminate, entire inflorescence branched.

4. Fruits with individual beaked achenes giving a spiny appearance to the globular heads 2 - 3.5 cm across. Drawing about one half natural size.

June - August. Ditches, margins of ponds and wet ground.

Distribution: Probably state wide.

There are thousands of grass, rush, and sedge species, many of which are found in Illinois. All are easily confused and not ordinarily identified with a casual glance. When it is necessary to identify these plants it is advisable to consult manuals and books dealing with them in detail. We have omitted grasses and rushes, as explained in the introduction, these were seldom collected and sent in for identification by fishery biologists. However some sedges were involved in the collections. The following general statements may be helpful in learning to separate plants of the grass, sedge and rush families:

Stems round or flat, never triangular, usually hollow except at the nodes, leaves 2-ranked, leaf sheaths split lengthwise on the side opposite the blade, fruit a grain. Grasses (Gramineae).

Stems often triangular, usually with a pith (not hollow), leaves 3-ranked, leaf sheaths usually continuous around the stem, fruit an achene. Sedges (Cyperaceae).

Stems round, usually solid, leafless or with a few basal or stem leaves, fruit a capsule. Rushes (Juncaceae).

In the FLORA OF ILLINOIS fourteen genera of sedges are listed and of these we have included only the following: *Cyperus* (sedges), *Eleocharis* (spikerushes), and *Scirpus* (bulrushes). The following key may assist in separating plants of these three genera:

Key to Genera

Stems (culms) usually triangular, spikelets arranged in a spike, head, or umbel-like cluster, bracts generally several, long and leaf-like just below the inflorescence, achenes with neither beak nor persistent bulbous style base. *Cyperus*. Page 122.

Stems (culms) round their entire length, spikelets strictly solitary and terminal, no leafy bracts below the inflorescence, achene topped with a bulbous, persistent style base. *Eleocharis*. Key below.

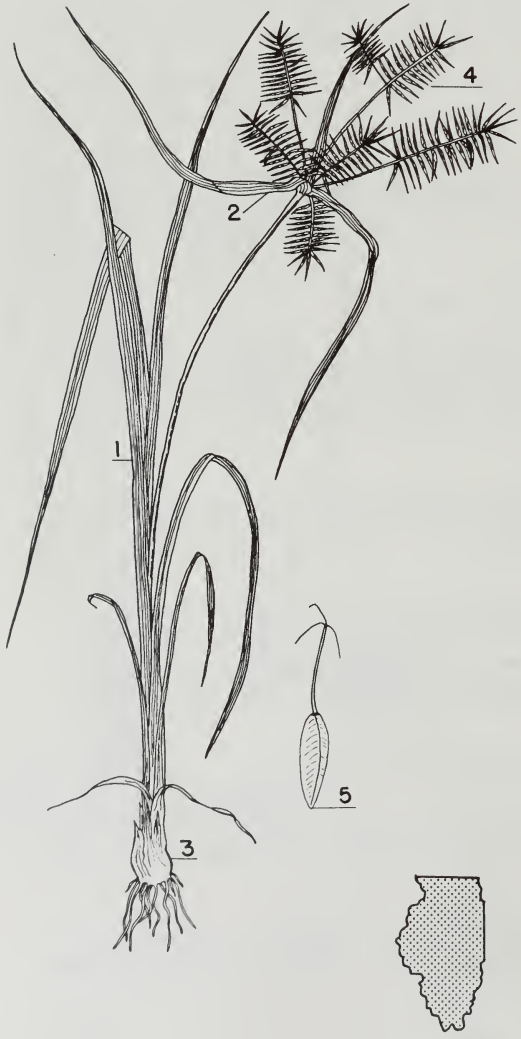
Stems (culms) round to triangular, spikelets lateral or in a terminal cyme, a single leaf-like bract appearing as if a continuation of the stem, or several bracts below the inflorescence or none, achene not topped with the bulbous, persistent style base but with a slender tip. *Scirpus*. Page 123.

Key to Species of *Eleocharis*

Stems (culms) 5 - 13 cm long, hair-like, very slender. Bristles at the base of the achene about as long as the achene. Style 3-parted. *Eleocharis acicularis*. Page 124.

Stems (culms) 50 - 70 cm long, not hair-like, 2 - 5 mm thick. Bristles at the base of the achene longer than the achene. Style 2-parted. *Eleocharis obtusa*. Page 125.

Gleason: Vol. 1, 246-366.
Fassett: 122-163.
Muenscher: 147-174.
Jones: 301-323.
Hitchcock, A.S. 1951. Manual of the grasses of the United States. Second Edition revised by Agnes Chase. U. S. D. A. Misc. Pub. No. 200, Washington, D.C.
Mohlenbrock, R. H. and Drapalik, D. J., have treated the CYPERACEAE OF ILLINOIS in THE AMERICAN MIDLAND NATURALIST as follows: Vol. 63, No. 2, April 1960, pp. 270-306; Vol. 67, No. 2, April 1962, pp. 398-423; Vol. 69, No. 2, April 1963, pp. 441-455; Vol. 70, No. 1, July 1963, pp. 1-46.



LEAN SEDGE

Cyperus strigosus L.

1. Leaves 1 - 2.4 cm wide, much longer than wide, soft, numerous, from the plant base.

2. Leaf-like bracts 2-7, arising below the inflorescence, each 35 - 50 cm long, very narrow, often extending beyond the flowering parts.

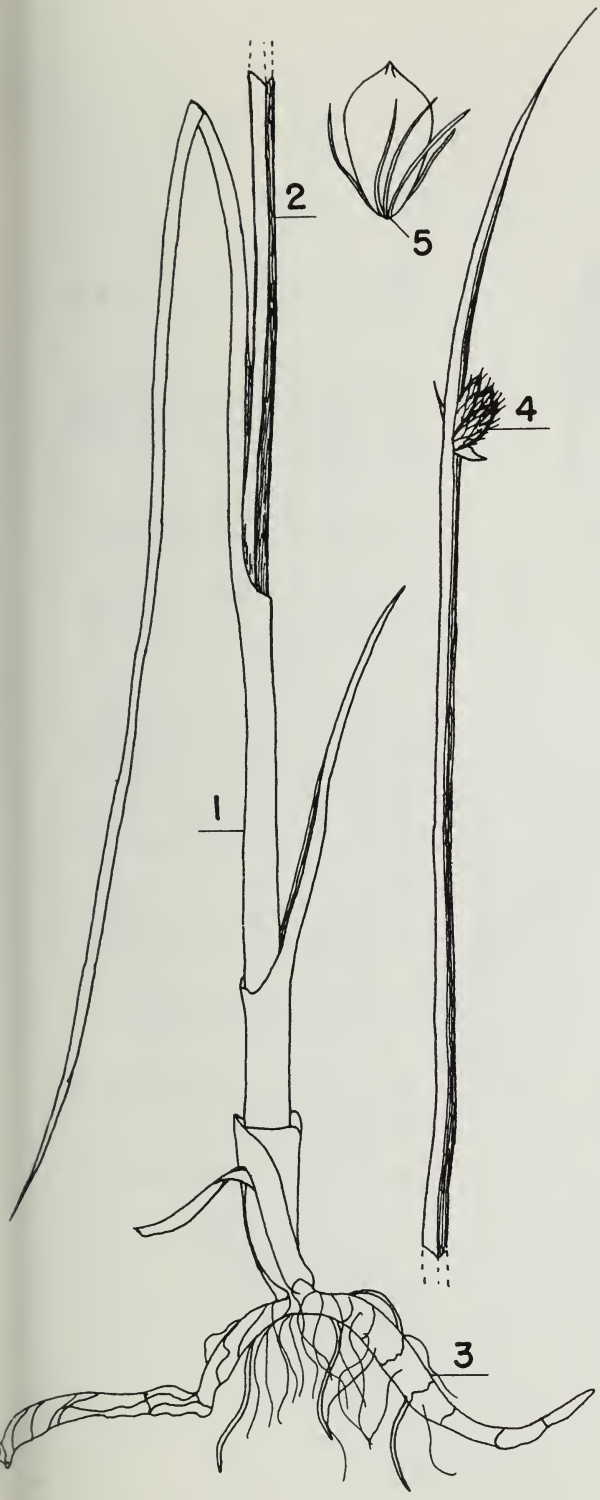
3. Stems (culms) 1 to several, 20 - 90 cm long, smooth, arising from a hard, corm-like base. Some entire plants, however, may be only a few centimeters in height.

4. Flowers very small, in brown spikelets radiating horizontally from the central axis, and forming a branching, umbel-like inflorescence.

5. Fruits (achenes) 1.5 - 2.5 mm long, very small, oblong, tipped with the persisting 3-parted style. Drawing enlarged 5 times.

August - October. Moist fields, roadsides, ditches and ponds.

Distribution: Throughout the state.



AMERICAN BULRUSH

Scirpus americanus Pers.

1. Leaves with lower sheaths overlapping and extended into blades 30 - 40 cm long.

2. Stems (culms) 100 - 120 cm tall, stiff, erect, dark green, sharply and conspicuously triangular.

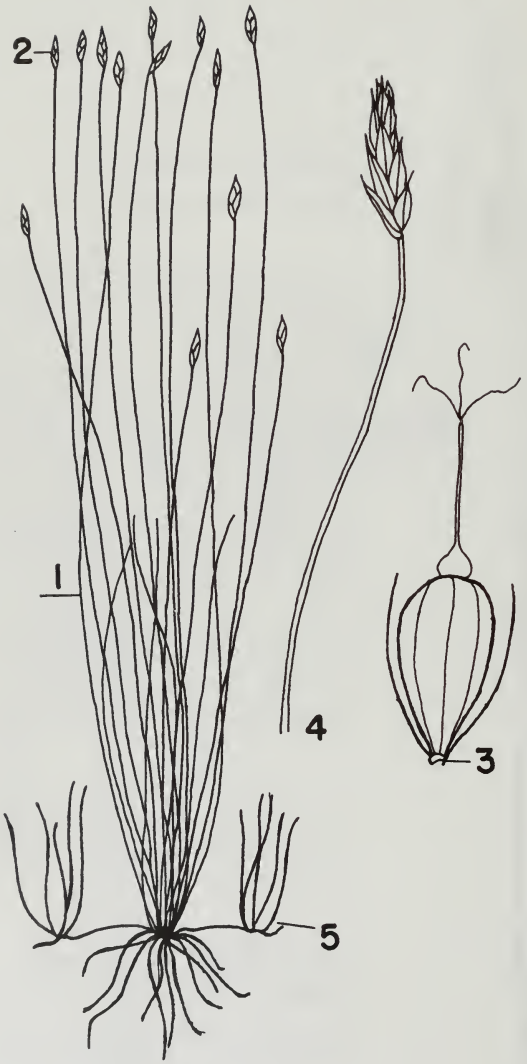
3. Rhizomes, from which culms arise, dark brown to black, often long, thick, sturdy.

4. Flowers very small, crowded into spike-like clusters 0.5 - 2.5 cm long. The culm continuing beyond the flower spike as a bract 3 - 10 cm long.

5. Achene 2.5 - 3 mm long, dark gray to black. Bristles not as long as the achene. Drawing enlarged 8 times.

July - August. Marshy ground, margins of ponds, lakes, rivers.

Distribution: Probably state wide.



SLENDER SPIKERUSH

Eleocharis acicularis (L.) R. & S.

1. Stems (culms) 5 - 13.5 cm long, usually hair-like, arising from the plant base in tufts, often forming mats.

Leaves reduced to bladeless sheaths at the base of the stems (culms).

2. Flowers very small, crowded into a solitary, terminal spikelet 2 - 6.5 mm long.

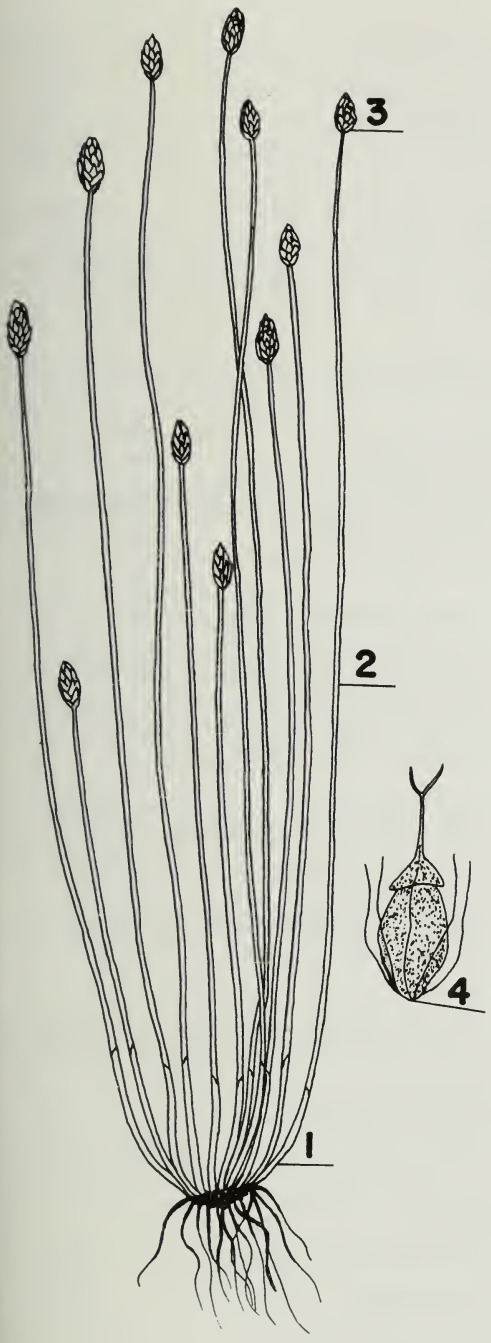
3. Achene 0.5 - 0.7 mm long, light to dark gray, obovoid, very small, style 3-parted. Bristles at the base about as long as the achene. Magnification is necessary for study. Drawing enlarged 30 times.

4. Spikelet. Drawing enlarged 4 times.

5. Rhizome with new plants.

June - August. Margins of ponds and on wet ground.

Distribution: Probably state wide.



BLUNT SPIKERUSH

Eleocharis obtusa (Willd.) Schult.

1. Leaves reduced to bladeless sheaths.

2. Stems (culms) up to 50 - 70 cm long, up to 2 - 5 mm thick, soft, arising from the base of the plant in tufts. The sheath enclosing the base of each culm is easily observed and is blunt at the tip.

3. Flowers very small, crowded into a solitary, terminal, oval spikelet 2 - 12 mm long.

4. Achene 1 - 1.5 mm long, dark brown, smooth, shining, very small, style 2-parted. Bristles at the base longer than the achene. Magnification necessary for study. Drawing enlarged 10 times.

June - August. Margins of ponds and on wet ground.

Distribution: Probably state wide.

Achene. A small, hard, dry one-seeded fruit.
Acicular. Long and needle-shaped.
Acuminate. Tapering at the apex or tip and ending in a point.
Acute. Sharp-pointed or ending in a point.
Adnate. United or attached to a different part. Stipules are adnate to the stem or petiole.
Alternate. Borne singly and placed at different heights on a stem.
Anther. The part of a stamen bearing pollen.
Auricle. An ear-shaped appendage, generally at the base of a leaf blade.
Awn. A coarse, hair-like appendage, usually stiff in proportion to its size.
Axil. The upper angle in the petiole of a leaf or branch of a stem.
Axillary. In an axil.
Axis. That portion of a plant from which a series of leaves or flowers arise. The central part of a longitudinal support.

Beak. A small tip, as applied to fruits or seeds.
Bladder. An inflated, thin-walled structure.
Blade. The expanded terminal portion of an organ, as leaf blade, flower petal or sepal, in contrast to the narrowed basal portion.
Bract. A modified leaf, usually below a flower or flower cluster.

Calyx. The outer series of floral leaves often green in color.
Capillary. Very fine, slender or hair-like.
Capsule. A dry, dehiscent fruit nearly always containing two or more seeds.
Cespitose. In tufts and collectively forming mats.
Clasping. The base (of a leaf) completely or partly surrounding the stem.
Compound leaf. Two or more leaflets on a common petiole.
Cordate. Heart-shaped.
Corm. A thickened, rounded solid underground stem.
Corolla. The second set of floral leaves, made up of petals often colored.
Culm. The stem of a grass or sedge.
Cuspidate. Ending in a sharp point.
Cyme. A type of inflorescence in which each flower is strictly terminal to the main axis or to a branch.

Dentate. With coarse teeth.
Dichotomous. Two-forked one or more times, the branches equal or nearly so.
Dioecious. With staminate and pistillate flowers on different plants.
Dissected. Divided into narrow segments.
Divided. Separated to the base or midvein (of a leaf).
Dorsal. Pertaining to the back or outer surface.

Elliptical. In the form of an ellipse, widest in the center.
Emersed. Raised above the water surface.
Entire. Smooth, with no teeth, serrations or lobes.

Falcate. Curved or shaped like a sickle blade.
Filiform. Slender and thread-like.
Filament. That part of a stamen below the anther or pollen-bearing part.
Fruit. A mature and ripened ovary.

Gelatinous. Having the nature of jelly, or jelly-like.
Gland. A secreting surface or structure; an appendage having the appearance of such an organ.
Globose. Shaped like or with the appearance of a globe.
Globular. Globe-shaped or spherical.

Hastate. Shaped like an arrowhead, with the basal lobes pointing outward.
Hypanthium. The receptacle on which the calyx, corolla and stamens are inserted.

Inflorescence. Arrangement of flowers on a stem.
Internode. That part of a stem between two nodes or joints.
Irregular. Upper half of the flower unlike the lower half.

Keel. A ridge, like the keel of a boat.

Lanceolate. Shaped like a lance, longer than wide and tapering toward the apex.
Leaflet. One blade of a compound leaf.
Ligule. A thin, sometimes papery projection from the top of the leaf-sheath in grasses, sedges, etc.
Linear. Long and narrow, with the margins or edges nearly parallel.
Lobe. A part or segment of an organ. In leaves a division to nearly the middle of the blade.

Margin. A border or edge.
Megaspore. The larger of two kinds of spores, generally giving rise to a structure bearing female reproductive organs.
Mericarp. The portion of a fruit that splits away, apparently as a separate part.
Microspore. The smaller of two kinds of spores, generally giving rise to a structure bearing male reproductive organs.
Midrib. The central or main rib of a leaf or similar structure, also referred to as midvein.
Monoecious. Separate staminate and pistillate flowers on the same plant.
Mucilaginous. Slimy or like mucilage.
Mucronate. With an abrupt point or tip.

Net veined. The veins joining and forming a net.
Node. The joint of a stem where the leaves are attached.

Obtuse. Rounded or blunt at the tip.
Opposite. On opposing sides of a stem, as in leaves with two at a node.
Orbicular. Round in outline.
Oval. The width more than half the length.
Ovary. The basal part of the pistil and containing the ovules, an immature fruit.
Ovate. Shaped like a hen's egg, the broad end down.
Ovoid. Used to describe solid objects ovate in outline.
Ovule. The organ which may, after fertilization, develop into a seed.

Palmate. Radially lobed, the parts arising from a common point like fingers of a hand.
Panicle. A compound or branched inflorescence, loosely branched and longer than wide.
Papilla. A small, nipple-shaped projection.
Pectinate. Having narrow, closely-set segments like teeth of a comb.
Pedicel. Stalk of one flower in a cluster.

Peduncle. A primary flower stalk supporting a cluster or a single flower.
Peltate. Shaped like a shield and used to describe a leaf which has a petiole attached at near mid-underside
Pericarp. The wall of a fruit.
Persistent. Remaining attached after other parts ordinarily fall off.
Petal. A separate segment or part of the corolla.
Petiolate. A petiole present.
Petiole. A leaf stalk.
Pinnate. The parts arising on each side of a rachis (midvein), feather-like.
Pistil. A floral part composed of stigma, style, and ovary.
Pistillate. Bearing pistils and ordinarily without stamens.
Pubescent. With a fine covering of hairs.
Punctate. With fine dots or glands.

Quadrifoliate. With four leaflets.

Raceme. A type of inflorescence with an elongated unbranched axis bearing lateral flowers.
Rachis. An axis bearing flowers or leaflets.
Recurved. Curved backward.
Regular. In describing a flower with the parts of each circle similar in size and shape.
Reniform. Kidney-shaped, longer than wide.
Rhizoid. Root-like but of very simple structure.
Rhizome. A modified underground stem.
Rosette. A cluster of leaves crowded on very short internodes.

Sagittate. Arrow-head-shaped with the lobes extending downward.
Scale-like. Applied to very small leaves or bracts generally appressed to a stem.
Scape. Applied to a leafless structure bearing flowers and generally arising from the ground.
Seed. A ripened ovule.
Segment. One of the parts into which anything naturally separates or is divided.
Sepal. One of the outer parts of a calyx, generally green.
Serrate. Like teeth in a saw (generally applied to leaf margins).
Sessile. With no stalk or petiole.
Sheath. Tubular envelope, usually used to describe part of the leaf of a grass or sedge enclosing the stem or culm.
Simple. A leaf with the blade made up of one piece and no separate leaflets.
Sinus. A depression between two adjoining lobes.
Solitary. Single.
Spadix. A thick, fleshy part of some plants and generally bearing small flowers.
Spathe. An envelope-like bract generally enclosing a flower or group of flowers.
Spatulate. Shaped like a spatula, rounded at the summit and tapering to the base.
Spike. An inflorescence with sessile flowers on an axis.
Spikelet. A small spike, the unit of inflorescence in grasses and sedges.
Spinulose. Minutely spiny or beset with small spines.
Sporangium. An organ in which spores are produced.
Spore. A one-celled reproductive organ generally used in connection with non-flowering plants.
Sporocarp. Fruit cases containing sporangia or spores.
Stamen. A floral part composed of anther and filament.
Staminate. Relating to or consisting of stamens. Ordinarily without pistils.
Stigma. The terminal part of a pistil adapted to reception and germination of pollen.

Stipule. Appendages at the base of the petiole of some leaves.
Stolon. A horizontal branch generally at the base of a plant and developing roots.
Style. The portion of the pistil connecting the stigma and ovary.
Submersed. Growing entirely under water.

Terminal. Situated at or forming the end or extremity of something.
Thallus. A vegetative body as applied to some plants which lack distinct stems and leaves.
Tuber. Thickened part of a root generally for food storage.
Tubercle. A small tuber or tuber-like body.

Umbel. Applied to an inflorescence where the branches arise from a common point like the frame of an umbrella.

Vein. Externally visible vascular bundle as that found in a leaf.
Venation. Arrangement of veins.
Ventral. Situated on or pertaining to the lower side.

Whorl. Three or more leaves or flowers arranged in a circle around the axis or stem at a node.
Wing. Any membranous or thin expansion bordering or surrounding a seed or an achene.

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INDEX OF COMMON NAMES

EQUIVALENTS OF INCHES IN TENTHS TO MILLIMETERS

Inches	Tenths of Inches									
	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
	Millimeters									
0	0	3	5	8	10	13	15	18	20	23
1	25	28	30	33	36	38	41	43	46	48
2	51	53	56	58	61	64	66	69	71	74
3	76	79	81	84	86	89	91	94	97	99
4	102	104	107	109	112	114	117	119	122	124
5	127	130	132	135	137	140	142	145	147	150
6	152	155	157	160	163	165	168	170	173	175

1 mm = .001 m = .1 cm = .03937 in

1 cm = .01 m = 10 mm = .3937 in

1 m = 100 cm = 1000 mm = 39.37 in

1 in = 2.54 cm

1 ft = 30.48 cm

1 yd = 91.44 cm

NOTES